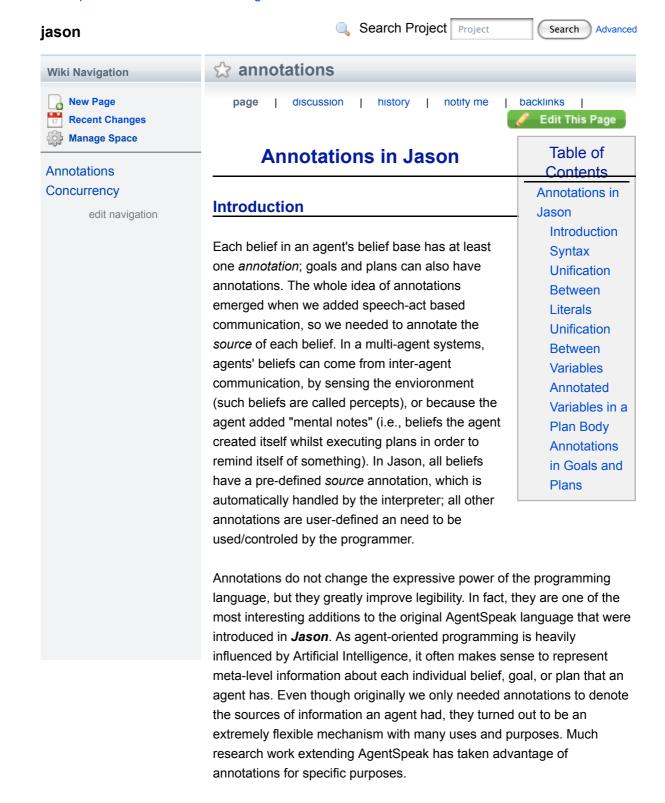
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- Jump to project navigation
- Jump to downloads for SourceForge.net



However, in order to deal with annotations, we have had to create a more sophisticated unification algorithm. This article presents how it works by means of examples.

Syntax

Annotations are represented with the same syntax of a list in Prolog; however, this needs to be a list of *terms* rather than literals, and it must immediately follow the literal or term they are annotating (plans are annotated in the optional label they have, which is itself a predicate). For example:

```
p(t)[source(ag)]
```

represents a belief literal p(t) with a single annotation source(ag) which is an annotation handled by Jason to say that this belief originating from agent ag telling this agent that ag believed p(t) to be true. Other possible sources are source(percept) and source(self); the former means that belief p(t) originated from perceiving the environment and the latter from a mental note. In the following example:

```
p(t)[a1,a2(0)].
```

the literal p(t) has two annotations, terms a1 and a2(0).

One important thing to note is that even though the complete notation for lists in Prolog is used for *Jason* annotations, this is semantically treated as as *set* of annotations.

Unification Between Literals

In the case of a unification like A = B, the set of annotations of the first argument A has to be a *subset* of the annotations of the second argument B.

Example:

The "tail" of the list of annotations (in this case working like set difference) can be used:

```
p[a2|T] = p[a1,a2,a3]; // T unifies with [a1,a3]
p[a1,a2,a3] = p[a1,a4|T]; // T unifies with [a2,a3]
```

When the unification is between a triggering event and a plan's trigger, the triggering event is the *first* argument of the unification. So for an event + ! g [a], the relevance of the following plans would be as follows:

However, for an event + g a plan with trigger + g a j is *not* relevant. In other words, to put an annotation is a plan's trigger means "this plan is relevant only for events with (at least) these annotations, or annotations that unify with these".

Unification Between Variables

Consider the various cases of the a unification X[As] = Y[Bs] below; the notation used is X and Y for variables, and As, Bs, Cs, and Ds are sets of annotations.

X and Y are ground

```
X = p[Cs] // unify X with p[Cs], where Cs is a set of annotations
Y = p[Ds] // unify Y with p[Ds], where Ds is a set of annotations
X[As] = Y[Bs] // unifies if (Cs union As) is a subset of (Ds union Bs) ...
// ... after attempting to unify the annotations individually
```

Example:

```
X = p[a1,a2];
Y = p[a1,a3];
X[a4] = Y[a2,a4,a5]; // unifies
```

(note that tail of lists does not work here. **TODO** make it to work as for literals? In the current implementation, the tail in annotations of variables has no meaning)

Only X is ground

note: what Y should unify with is p[(Cs + As) - Bs]. **TODO**: the current implementation is as above and not as proposed in this note.

Example:

```
X = p[a1,a2];
```

```
X[a3] = Y[a1,a2,a3,a4,a5]; // unifies Y with p
X[a3] = Y[a2,a3,a4,a5]; // does not unify
X[a3] = Y[a1,a2,a4,a5]; // does not unify
```

Only Y is ground

```
Y = p[Ds]
X[As] = Y[Bs] // unifies if As in (Ds union Bs)
// and unifies X with p
```

note: the annotations of X is an issue to discuss (what X should unify with). It could be [], since [] is a subset of anything. It could be: X = p[(Ds + Bs) - As]. A minimal subset approach or a maximal subset approach. **TODO**: the current implementation is like above (minimal subset approach).

The problem is that x = p[a,b,c] unifies x with p[a,b,c], i.e., the maximal approach. So the current implementation is somewhat inconsistent. Proposal: use always the maximal approach when y is ground and the minimal when x is ground.

Example:

```
Y = p[a1,a3];

X[a1] = Y[a4,a5]; // unifies X with p

X[a6] = Y[a4,a5]; // does not unify
```

Neither X nor Y are ground

Annotated Variables in a Plan Body

The annotations of the variable and the annotations of its instantiated are combined (using set union) to produce the corresponding event:

```
X=g[a];
...
!X[b]; // produce event +!g[a,b]
```

Annotations in Goals and Plans

(tbd)



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