Department of Computer Science

ALMA : A REASONING SYSTEM WITH A LIFETIME OF ITS OWN

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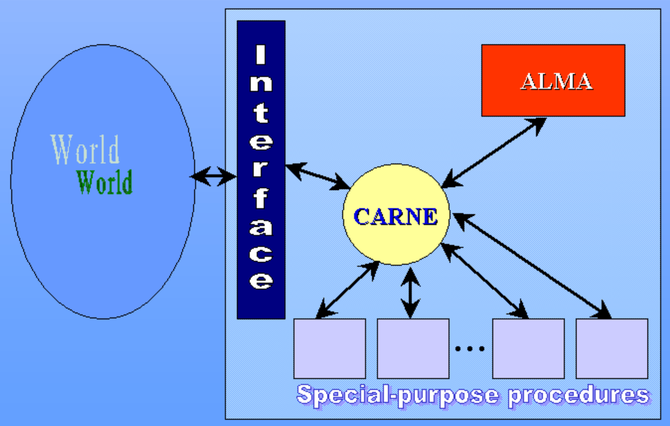
- **Reasoning by real systems evolves in time.**
  This fact is an essential part of the reasoning for many applications, e.g.:
  - planning with tight deadlines
  - taking coordinated action at the right time
  - noting and correcting reasoning errors
  - reasoning with contradictory information
  - real time belief revision
  - natural language dialogue
- **Active logic**
  - evolving time updated during reasoning
- **ALMA**
  - active logic inference engine
  - reasons in real time
  - accepts observations during reasoning
- **CARNE**
  - front-end to ALMA
  - interface to the world
  - can execute specialized procedures



Common Sense Reasoning

Clock Update

```
i:    now(i)
-------------------
i+1: now(i+1)
```

Contradiction Detection

```
i:    p, not(p)
-------------------------
i+1: contra(p,not(p),i)
     distrust(p,i)
     distrust(not(p),i)
     distrust(q,i)
```

[q is a consequence of p or not(p)]

Finding Derivations

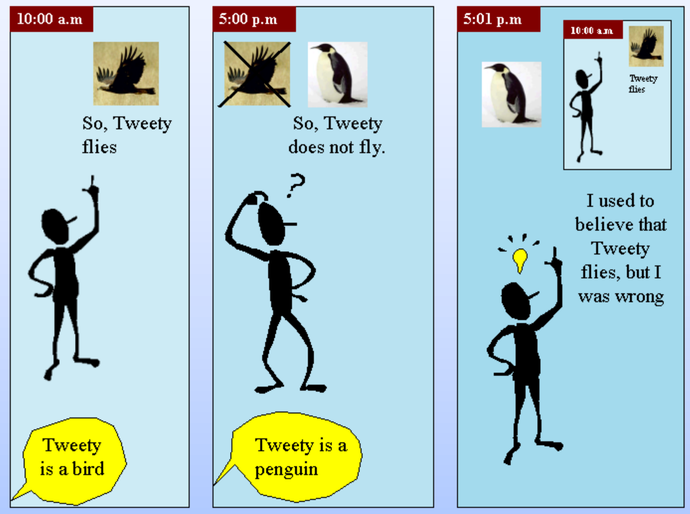
```
i:    p, if(p,q)
i+1: p, if(p,q), q
-----------------------------------------
i+2: deriv(q,[[deriv(p,[]),deriv(if(p,q),[])]])
```

Introspection

```
i:    p
-------------------
i+1: pos_int(p,i)
```

Derivation Time

```
i:    p, if(p,q)
i+1: q
-------------------------
i+2: derivation_time(q,i+1)
```



Application to Natural Language Dialogue

[10:00am]	**User:**	Send the New York train to Buffalo
	System:	[*sends Metroliner to Buffalo*]
[10:01am]	**User:**	No…
	System:	[*returns Metroliner to New York*]
[10:01:02]	**User:**	Send the New York train to Buffalo
	• *Good*	[*sends Northstar to Buffalo*]
	• *Bad*	[*sends Metroliner to Buffalo*]

The pattern [Send X], [No, send X] generates a contradiction in ALMA and then triggers a repair