Department of Computer Science

ALMA : A REASONING SYSTEM WITH A LIFETIME OF ITS OWN

Don Perlis, Waiyian Chong, Darsana Josyula, Yoshi Okamoto, Khemdut Purang

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

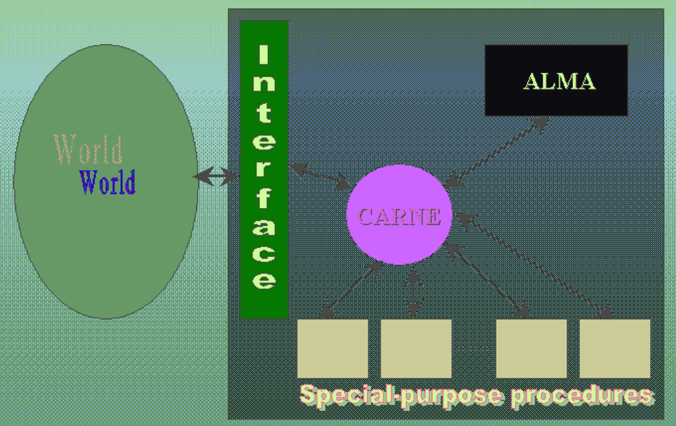
- evolving time updated during reasoning

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**

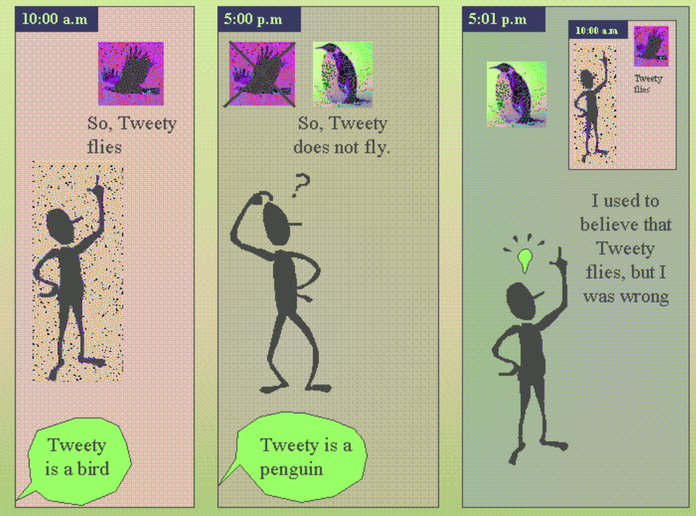
```
i:    p, if(p,q)
i+1: p, if(p,q), q
-----------------------------------------------
i+2: deriv(q,[[deriv(p,[]),deriv(if(p,q),[])]])
```

♦ **Introspection**

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

♦ **Derivation Time**

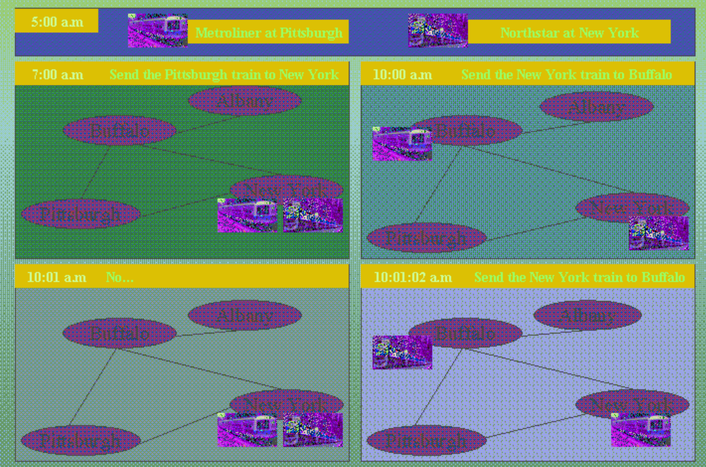
```
i:    p, if(p,q)
i+1: q
-------------------------
i+2: derivation_time(q,i+1)
```



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



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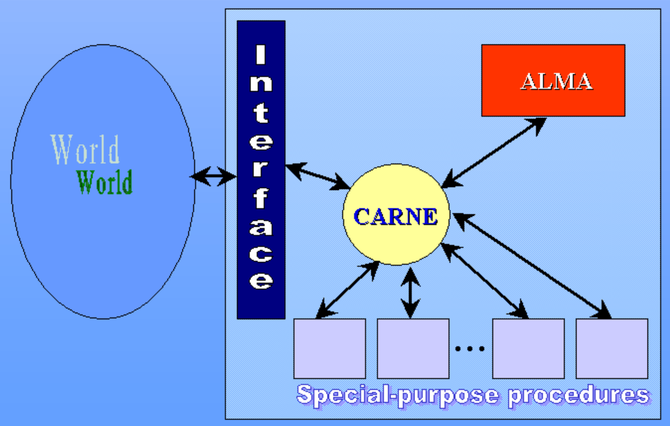

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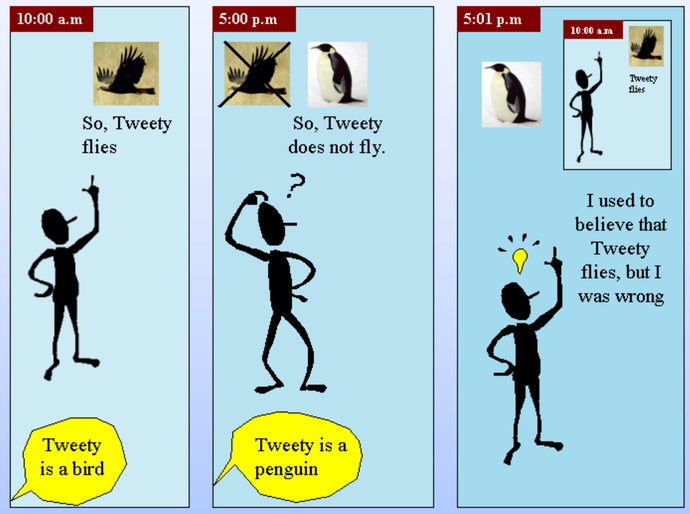

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