

Dialog Models for Troubleshooting

An Overview

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Outline

- 1 Troubleshooting Dialog
- 2 Dialog States
- 3 Contextual Knowledge
- 4 System Comparison
- 5 Conclusions
- 6 References

Dialog - Troubleshooting

user: trying chat again - Blackberry problem
rep.: Thank you for choosing to chat with IT. One moment please.
user: ok
rep.: What kind of Blackberry problem?
user: the screen is white - no graphics - battery is charged
rep.: May I please get some basic info from you for a ticket?
user: yes
rep.: What is your office phone number and working hours?
user: 704-335-4570, 8h00-18h00
rep.: SD542304 is your ticket #. The motherboard is faulty.
rep: You'll be sent a new one.
user: great, bye
rep.: Thank you for choosing to chat with us. Have a nice day.

Dialog - Troubleshooting

user:	trying chat again - Blackberry problem	1
rep.:	Thank you for choosing to chat with IT. One moment please.	2
user:	ok	3
rep.:	What kind of Blackberry problem?	4
user:	the screen is white - no graphics - battery is charged	5
rep.:	May I please get some basic info from you for a ticket?	6
user:	yes	7
rep.:	What is your office phone number and working hours?	8
user:	704-335-4570, 8h00-18h00	9
rep.:	SD542304 is your ticket #. The motherboard is faulty.	10
rep:	You'll be sent a new one.	11
user:	great, bye	12
rep.:	Thank you for choosing to chat with us. Have a nice day.	13

⇒ Sequence of [turns](#)

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⇒ Sequence of **turns** by **user** and

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⇒ Sequence of turns by user and system [ABD⁺07]

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⇒ Introduces [generic problem](#) (topic)

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⇒ Introduces **generic problem** plus **symptoms** (topic/focus) [ABD⁺07, KB10]

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⇒ Determines the **specific problem** [ABD⁺07]

Dialog - Troubleshooting

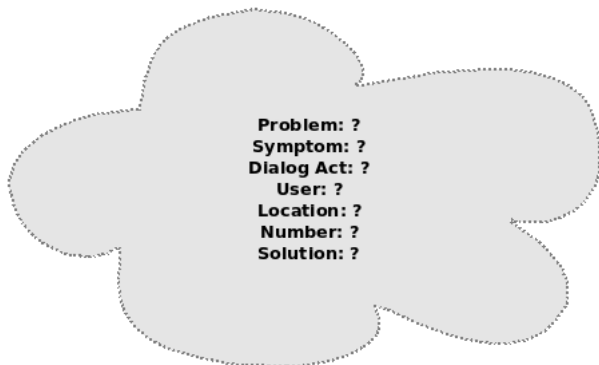
user: trying chat again - Blackberry problem	}	greet
rep.: Thank you for choosing to chat with IT. One moment please.		
user: ok	}	request
rep.: What kind of Blackberry problem?		
user: the screen is white - no graphics - battery is charged		
rep.: May I please get some basic info from you for a ticket?	}	ground
user: yes		
rep.: What is your office phone number and working hours?		
user: 704-335-4570, 8h00-18h00		
rep.: SD542304 is your ticket #. The motherboard is faulty.	}	state
rep: You'll be sent a new one.		
user: great, bye	}	greet
rep.: Thank you for choosing to chat with us. Have a nice day.		

⇒ Turns fulfil [dialog acts](#) [ABD⁺07, SCB⁺00]

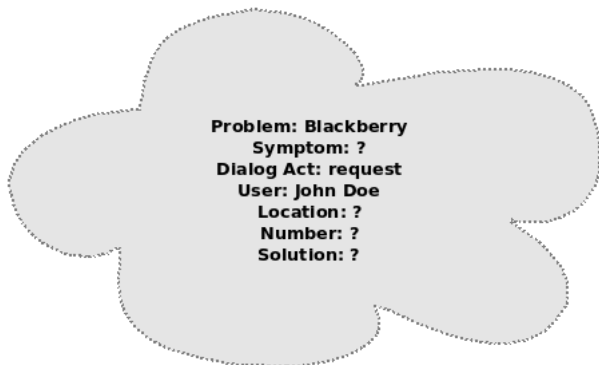
Dialog - Troubleshooting

user: trying chat again - Blackberry problem	}	greet
rep.: Thank you for choosing to chat with IT. One moment please.		
user: ok	}	request
rep.: What kind of Blackberry problem?		
user: the screen is white - no graphics - battery is charged		
rep.: May I please get some basic info from you for a ticket?	}	ground
user: yes		
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rep.: SD542304 is your ticket #. The motherboard is faulty.	}	state
rep: You'll be sent a new one.		
user: great, bye	}	greet
rep.: Thank you for choosing to chat with us. Have a nice day.		

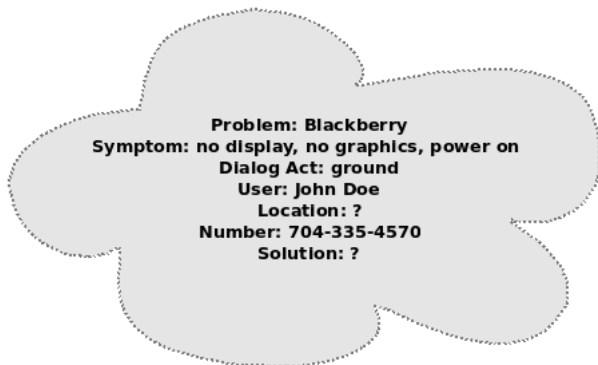
Remark: Dialog model encoded in [dynamic dialog state](#) [GMM00]




⇒ At the beginning, the frame/state is empty ([greet](#))



⇒ The user request induces a candidate problem ([request](#))




⇒ A conversation is engaged to gather more information (**ground**)




Problem: Blackberry motherboard
Symptom: no display, no graphics, power on
Dialog Act: ground
User: John Doe
Location: 2nd floor, office 202, desk 5
Number: 704-335-4570
Solution: ?

⇒ We continue until we fill the frame ([ground](#))



Problem: Blackberry motherboard
Symptom: no display, no graphics, power on
Dialog Act: state
User: John Doe
Location: 2nd floor, office 202, desk 5
Number: 704-335-4570
Solution: replace

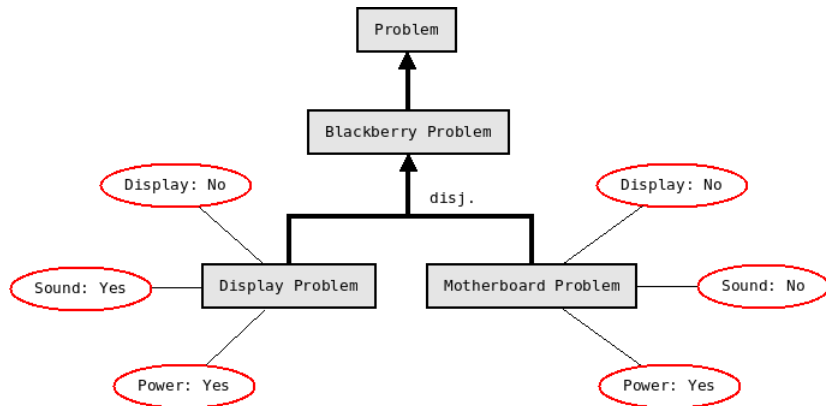
⇒ A solution is determined and the dialog ends (**state** + **greet**)



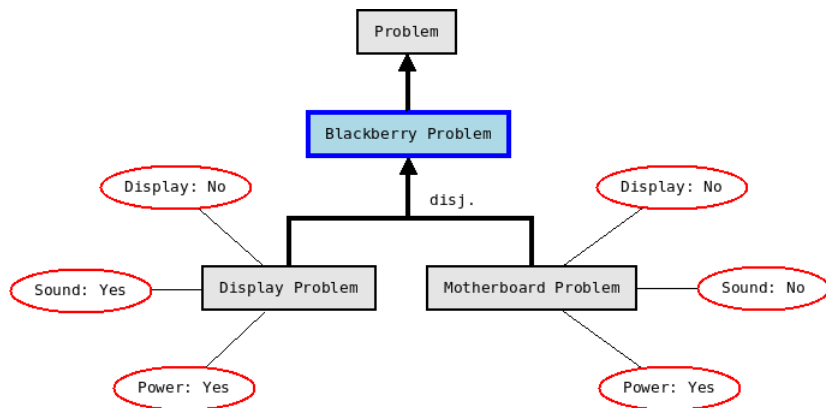
Problem: Blackberry motherboard
Symptom: no display, no graphics, power on
Dialog Act: state
User: John Doe
Location: 2nd floor, office 202, desk 5
Number: 704-335-4570
Solution: replace

Remark: exploited information **implicit in dialog context!**

Context - Blackberry World [QDR09]

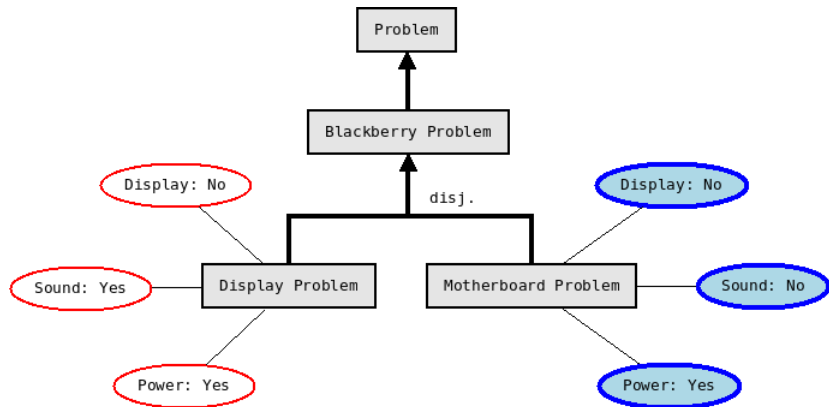


Context - Blackberry World [QDR09]



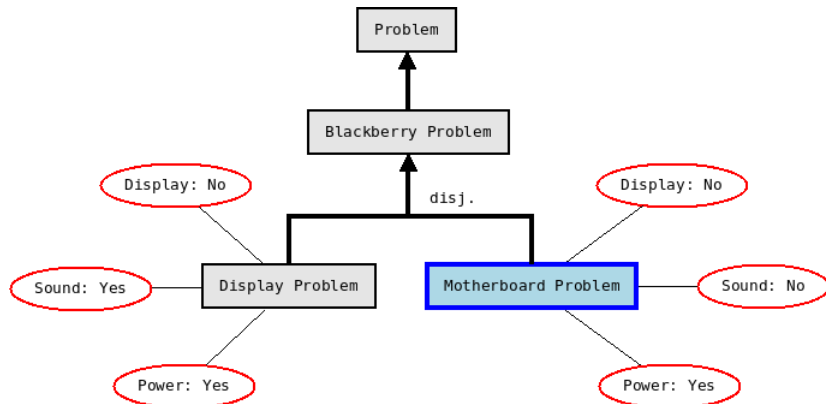
⇒ dialog topic

Context - Blackberry World [QDR09]



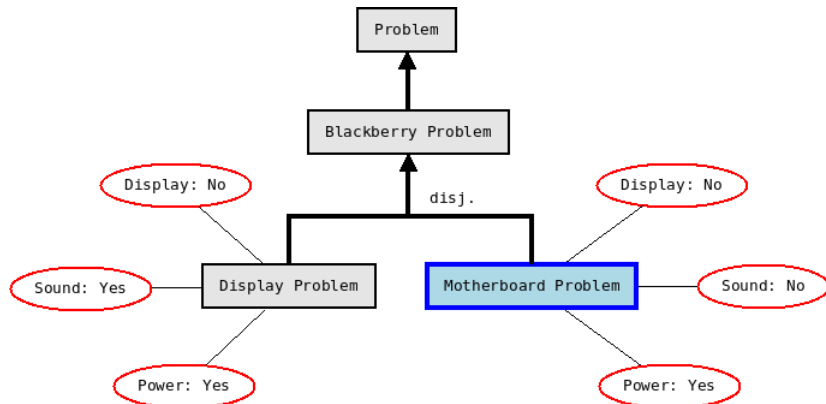
⇒ dialog focus

Context - Blackberry World [QDR09]



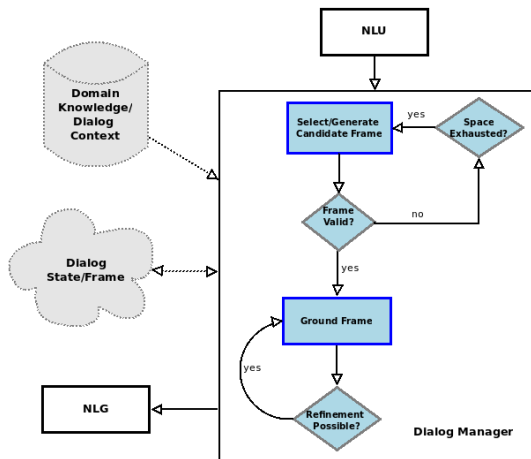
⇒ refine to **intended** topic via focus

Context - Blackberry World [QDR09]

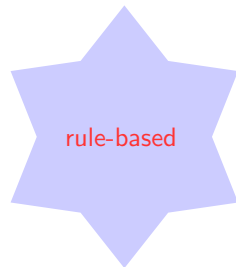
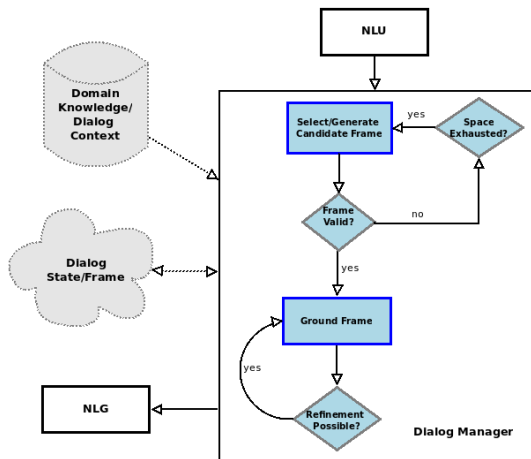


Remark: more context may come from, e.g., LDAP servers

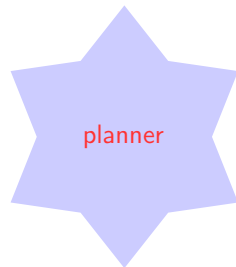
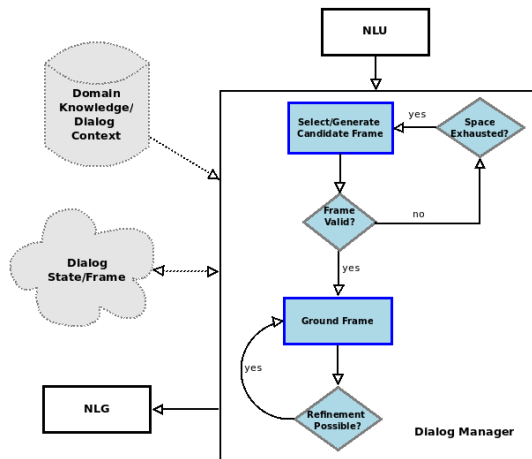
Comparison - Dialog Management [GMM00]



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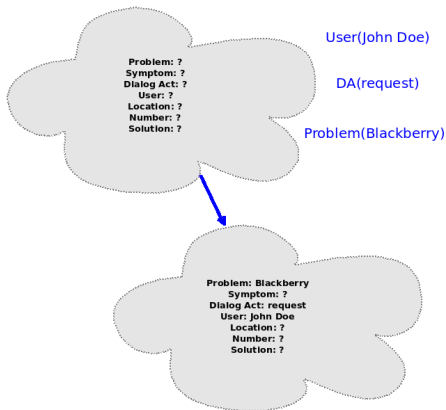
Comparison - Dialog Management [GMM00]

user: trying chat again - Blackberry problem

Comparison - Dialog Management [GMM00]

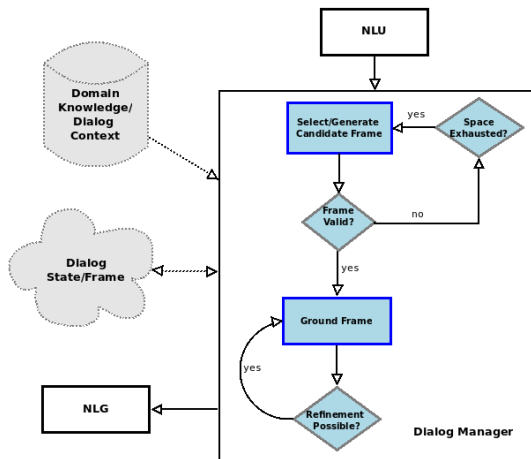
user: trying chat again - Blackberry problem

```
GREET(u,p,a):  
PRE:  
User(u), Problem(p), DA(a),  
a=request  
POST:  
AddProblem(p), AddDA(a),  
AddUser(u),  
Reply("Thank you for choosing to  
chat with IT.  
One moment please.")
```

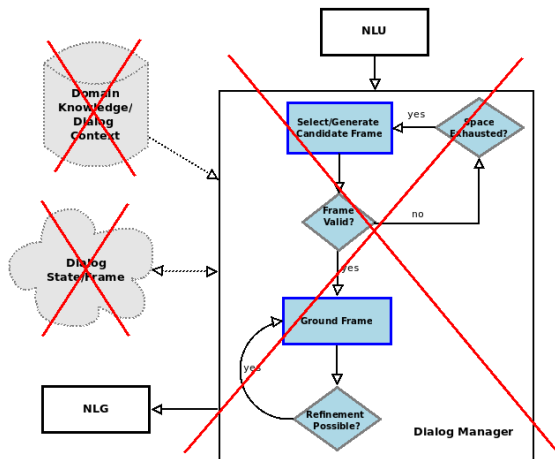


rep.: Thank you for choosing to chat with IT. One moment please.

Comparison - Dialog Management [GMM00]

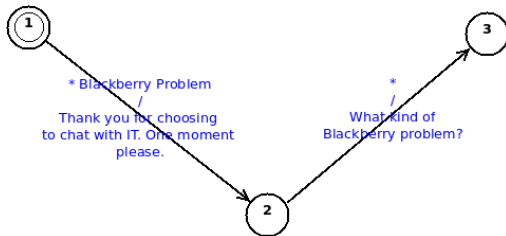


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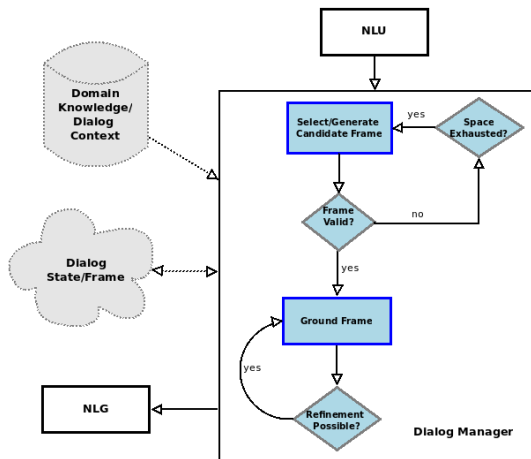


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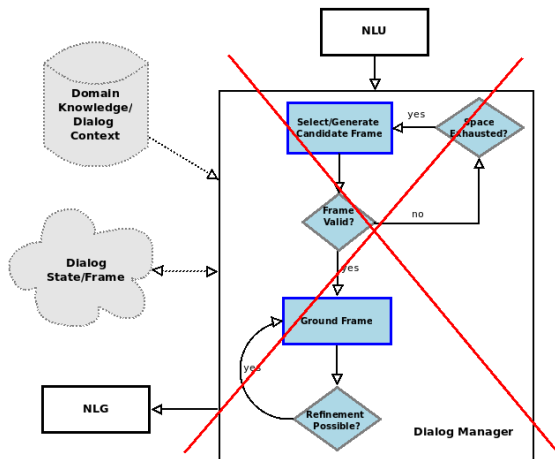
```
<category>
  <pattern>* Blackberry problem</pattern>
  <template>
    Thank you for choosing to chat with IT.
    One moment please.
  </template>
</category>
<category>
  <pattern>*</pattern>
  <template>
    What kind of Blackberry problem?
  </template>
</category>
```



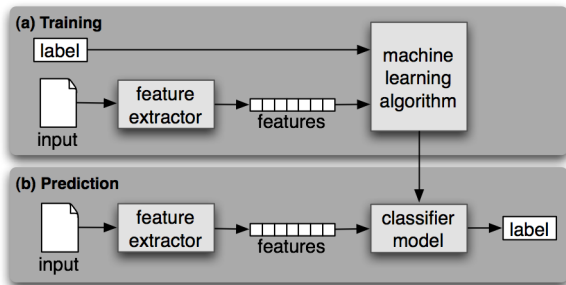
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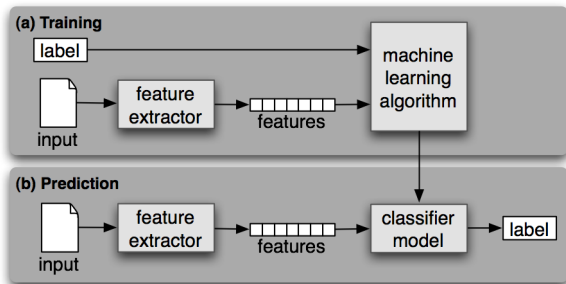


Comparison - Dialog Management [GMM00]



⋮
trying/GR chat/N again/ADJ -/P Blackberry/N problem/N
⇓
Req,User

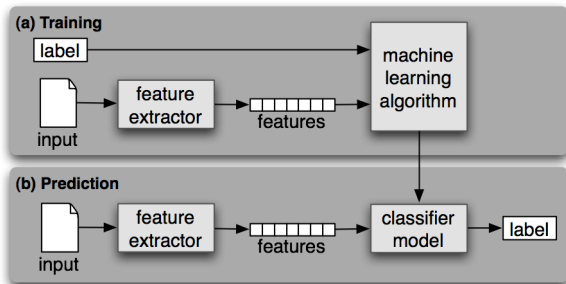
Comparison - Dialog Management [GMM00]



the/DT screen/N is/V white/ADJ - no/NE graphics/N - battery/N is/V charged/ADJ

⇓
?

Comparison - Dialog Management [GMM00]

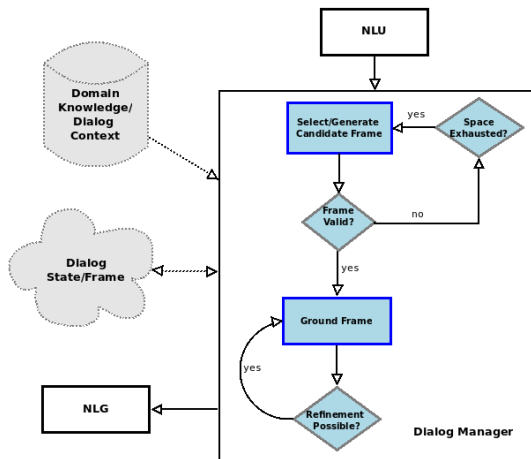


the/DT screen/N is/V white/ADJ - no/NE graphics/N - battery/N is/V charged/ADJ

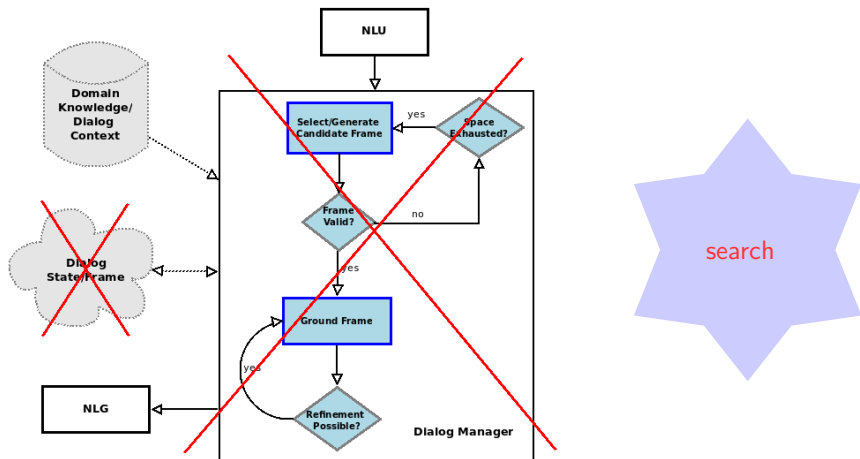


Ground, User

Comparison - Dialog Management [GMM00]



Comparison - Dialog Management [GMM00]



Comparison - Sample Systems

System	Internal State	Manager Type	Domain	Domain Knowledge	Anaphors/Context
AIDA [BJK ⁺ 13]	yes	rule-based	several	DB	?
VIDIAM [vSodA11]	no	classifier	medical	no	yes
Roundtable [FKM ⁺ 13]	yes	planning	several	DB	yes
BOB [KB10]	yes	ruled-based & logistic classifier	library	KB & DB	yes
Molino etal [MBS ⁺ 13]	no	search	game	KB & DB	?
Acomb et al. [ABD ⁺ 07]	no	classifier	troubleshooting	KB	no
LiteTALK [SCJ ⁺ 12]	no	finite-state	troubleshooting	patterns	yes
Sankar etal [SGVd08]	no	finite-state	troubleshooting	patterns	no
Boye etal [Boy07]	yes	planning	troubleshooting	KB	?
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⇒ finite-state systems keep no dialog state

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Remark: combine planning and rules with statistical NLU

Conclusions

- ① Provided an overview of dialog models for the troubleshooting domain
- ② Model must address the semantic, pragmatic and dynamic dimensions of dialog
- ③ Stressed the importance of relying on a dynamic dialog state or frame model
- ④ Stressed the importance of exploiting dialog context
- ⑤ Planning- and rule-based systems mixed with statistical NLU a good compromise



Thank You!!!

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