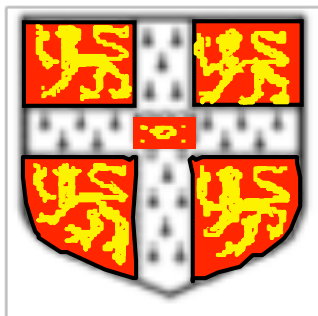


Open Domain Spoken Dialogue Systems

Steve Young

Attached are a few slides with my current ideas on what sort of architecture I think the python DMan should support.

The principle idea is that we should support multiple DMans (SLU+BeliefTracker+Policy) running simultaneously, with the ability to fire them up on demand, and delete them when no longer relevant.



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Objectives

To develop an architecture for spoken dialogue which:

1. allows user to reference multiple domains within a single conversation
2. supports natural conversation even in rarely visited domains
3. can learn automatically on-line through interaction with user
4. does not require rigid system-user turn-taking

Belief Space

The Belief State $\mathbf{b} \in \mathbb{R}^n$ is the core of the system.

$\mathbf{b} = \mathbf{b}_g \oplus \mathbf{b}_d$ has two major dimensions* encoding the agent's current estimate of:

- i) \mathbf{b}_g - the state of the conversation viewed as a half-duplex communication channel
- ii) \mathbf{b}_d - the user's beliefs, desires and intentions

\mathbf{b}_g is topic invariant and has a modest number of elements.

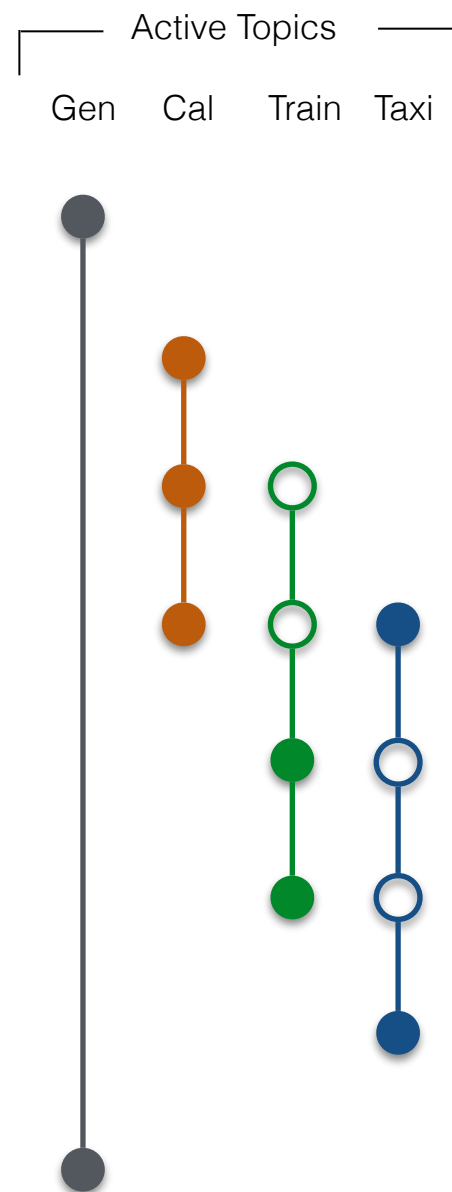
\mathbf{b}_d is *very* large but sparse wrt any particular topic.

* See for example Dynamic Interpretation Theory: Bunt et al (2010) "Towards an iso standard for dialogue act annotation", Proceedings of the 7th International Conference on Language Resources and Evaluation

Topics

- Conversations over time can be viewed as a sequence of potentially overlapping topic invocations
- Each topic is defined by a cluster of nodes in a Knowledge Graph
- Each topic t induces a partition \mathbf{b}_d^t denoting those elements of which \mathbf{b}_d are relevant to the topic
- Topic partitions can, and frequently do, overlap
- Each topic has an associated topic-specific belief tracker and dialogue policy

Example Dialogue



Hello, how can I help you?

What appointments do I have tomorrow?

You have a meeting at 10am with John and a teleconf at noon with Bill.

I need to go to London first thing, can you reschedule the meeting with John?

John is free tomorrow at 3pm, is that ok?

Yes, thats fine. I also need a taxi to the station.

Meeting with John at 15.00 is confirmed. What time do you need the taxi?

When does the train depart to London?

The 9.15am gets in at 10.06.

When is the one before that?

The train before that leaves at 8.45am and arrives at 9.40.

Ok I will take that, book the taxi for 8.15am from my house.

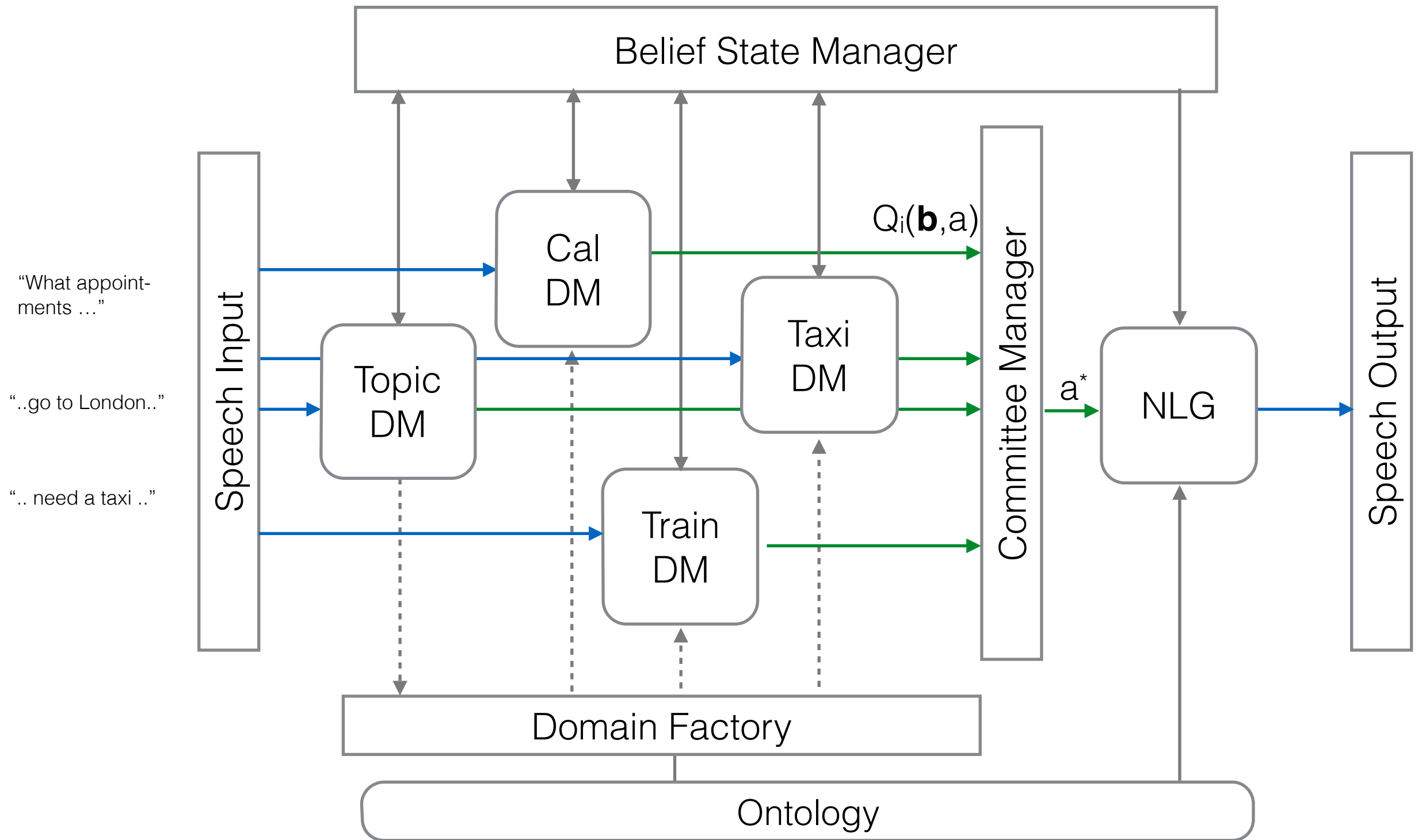
Ok, I will book the taxi for 8.15am, is that correct?

Yes that's right.

Ok. Do you need anything else?

Not for now thanks.

Run-time Architecture



Ontology+Instances=KG

