& Objectives: Tight integration of Automatic Speech Recognition (ASR) and phrase-based Statistical Machine Translation (SMT) systems.
  & - ASR word lattices as input to the SMT system
  & - Lattices encode a larger search space
  & - Exploit sub-sentential information

& Modeling issues:
  & - Propagation of ASR information to the SMT component
  & - Correct disfluencies, hesitations, spontaneous speech effects...
  & - Efficient phrase extraction

& Previous work:
  & - (E. Mutavox et al. 2005) reported translation gains using word lattices
  & - (Bertoldi et al. 2005) used confusion networks for integration with the SMT system

& We present: Generative source-channel model of speech to text translation.
  & - Tight coupling of the ASR and SMT systems using word lattices
  & - Implemented using weighted finite state machines (WFMS)

& So what's new?
  & - Conditional models vs joint models of target-source generation
  & - Unified modeling framework
  & - No need for extensive reformulation of underlying ASR and SMT models
  & - Simpler decoding and estimation procedures
  & - Lattice translation is a direct extension of our text translation systems

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**Generative Model of Speech Translation**

- **Noisy channel model for speech translation**

  - Target Speech
  - Target Sentence
  - Target Phrase
  - Source Phrase
  - Source Sentence

- **ASR Word Lattice**

  - Target Phrase
  - Source Phrase
  - Source Language

- **Translating ASR Word Lattices into Phrase Lattices**

  - Formulate speech translation as a modeling problem
  - Efficient extraction of phrases from ASR word lattice
  - ASR lattice pre-processing
    - Map unspoken tokens to NULL
    - Standard SMT operations: expansion, removal, and determination
    - Handling ambiguity in the ASR word lattice
    - Path-based likelihood pruning of ASR word lattices
    - Extracting phrases under the posterior distribution
    - What about the target LM $P_{T}'$?

- **Conclusion**

  - Presented a modeling framework for statistical speech-to-text translation
  - Extension of the phrase-based TM text translation model
  - Tight coupling of the ASR and SMT subsystems using lattices both as
    - Statistical models
    - WFMs based implementation
  - Demonstrated feasibility of the above approach.

Future Work:
- Initial formulation and implementation has weaknesses
  - Improved integration of the target language model
  - Phrase extraction under the posterior distribution
  - Improved pruning strategies for word lattices
  - Improved phrase coverage
  - Integrated development of the component ASR and SMT systems.