An intuition is presented for reasoning about knowledge description, acquisition and use.

Scripts and Plans are the first-class types presented by the paper.

Introduced by Roger Schank and Robert Abelson in 1977.

Related to the Minsky notion of Frames (1974)

“A frame is a data-structure representing a stereotyped situation”
• A **script** is a **predetermined** stereotyped sequence of actions that define a well known situation.

• Header:
  Describes when a script is appropriate.
  Acts as a trigger to instantiate a script

• Slots:
  Allows for objects in scripts
  Implicit introduction of objects inherent to a script

*ATRANS - a transfer (give or take) 
PTRANS - move or go
PLANS

• A Script requires foreknowledge. Novel situations require a distinct construct.

• Plans are abstract entities composed of possible combinations of action sequences that will achieve a given goal.
A narrative event chain is a **partially ordered set of events related** by a **common protagonist**.

An event is a verb together with its constellation of arguments.
- \( \langle v, d \rangle \) \( v \) is a verb,
- \( d \in \{ \text{subject, object, prep} \} \)

A chain is a tuple \( (L, O) \) where \( L \) is a set of events and \( O \) is a **partial temporal ordering**.
- \( L = \langle \text{pleads, } x \rangle, \langle \text{admits, } x \rangle, \langle \text{convicted, } x \rangle, \langle \text{sentenced, } x \rangle \)
- \( O = \{(\text{pleads, convicted}), (\text{convicted, sentenced}),...\} \)
NARRATIVE COHERENCE ASSUMPTION

• “Verbs sharing coreferring arguments are semantically connected by virtue of narrative discourse structure”.

• Documents may contain multiple narratives, but a series of argument-sharing verbs is more likely to participate in a narrative chain.

• Narrative approach captures grammatical constraints on narrative coherence
• The notion of a **protagonist** motivates the approach to **narrative learning**.

• A protagonist provides the focus to generate a perspective specific narrative chain.

• Later work will induce role constraints (Chambers, Jurafsky 2009)
LEARNING NARRATIVE RELATIONS

• Preliminary model learns basic information about narrative chain: protagonist, constituent events.

1. Dependency parse document.
   CoreNLP (Stanford)

2. Run coreference to cluster entity mentions.
   OpenNLP (Apache)

3. Count pairs of verbs with coreferring arguments.

4. Use point-wise mutual information (PMI) to measure relatedness.
LEARNING NARRATIVE RELATIONS

• From observed verb/dependency counts, PMI is approximated by:

\[
\text{pmi}(e(w,d), e(v,g)) = \log \frac{P(e(w,d), e(v,g))}{P(e(w,d))P(e(v,g))}
\]

• \(e(w, d)\) is the dependency pair of verb \(w\) and dependency \(d\).

• The numerator is defined:

\[
P(e(w,d), e(v,g)) = \frac{C(e(w,d), e(v,g))}{\sum_{x,y} \sum_{d,f} C(e(x,d), e(y,f))}
\]

• \(C(e(x,d), e(y,f))\) is the number of times the two events shared a coreferring entity filling the values of \(d\) and \(f\).

• Given all narrative events, next most likely event to occur can be predicted by:

\[
\max_{j:0 < j < m} \sum_{i=0}^{n} \text{pmi}(e_i, f_j)
\]

• \(n\) is number of events in chain, \(m\) is number of \(f\) events in corpus.
LEARNING NARRATIVE RELATIONS
PARTIAL ORDERING

- Timebank corpus used as supervised training data (condensing before and immediately before).

- Within Narrative Chains, temporal evaluation is performed in two stages:
  1) Evaluate temporal features of each event (trained on Timebank Corpus)
  2) Evaluate temporal features between all events that share an argument.

- For 2nd stage, each pair of events in a document that share a coreferring argument is treated as a separate ordering classification task.

- Count resulting number labeled before relations between each dependency pair.
NARRATIVE CLOZE

• An evaluation mechanism is necessary to demonstrate the predictive and explanatory power of the system.

• A cloze task (Taylor, 1953) evaluates a system for proficiency by removing a random word from a sentence and having the system attempt to fill in the missing component:
  “I forgot to ____ the waiter for the good service”

• The concept was extended (Deyes 1984) to encompass evaluation of discourse knowledge by removal of phrases that are recoverable from discourse relations.

• Chambers further extends the notion to capture the notion of a narrative cloze.
Use 10 news stories from 2001 (Gigaword Corpus) for development (hand selected for range).

69 news stories selected for training (randomly chose). Entity in most events chosen as protagonist.

All verb clauses involving protagonist are manually extracted and translated into narrative events (verb, dependency).

Narrative Cloze evaluated by “leave one out cross validation”. Removing one event and using remainder to generate ranked list of guesses.
To test the narrative coherence assumption, a baseline is established without protagonist. PMI is defined between all occurrences of two verbs in same document. A lower-bound threshold added to improve baseline performance.

- Protagonist model (without typed-dependencies) predicted 714 of removed events out of 740.

- Protagonist model shows 36% improvement over baseline.
USES

- Coreference
  - Resolve pronouns (he, she, it, etc.)
- Summarization
  - Inform sentence selection with event confidence scores
- Aberration Detection
  - Detect surprise/unexpected events in text
- Story Generation
  - McIntyre and Lapata, (ACL-2009)
- Textual Inference
  - Does a document infer other events
- Selectional Preferences
  - Use chains to inform argument types