Social Network Extraction from Text

Apoorv Agarwal

July 12, 2010

In collaboration with: Dr. Owen Rambow and Sidharatha Nallu
Outline (Part II)

Entity Extraction
  What is an Entity?
  What is an Entity Mention?
Outline (Part II)

Entity Extraction
  What is an Entity?
  What is an Entity Mention?

Relationship Extraction
  What is a Social Relationship?
  Types of Relationships (short overview)
  Our Intention: Feedback
Outline (Part II)

Entity Extraction
  What is an Entity?
  What is an Entity Mention?

Relationship Extraction
  What is a Social Relationship?
  Types of Relationships (short overview)
  Our Intention: Feedback

Interaction Relation (INR)
Outline (Part II)

Entity Extraction
What is an Entity?
What is an Entity Mention?

Relationship Extraction
What is a Social Relationship?
Types of Relationships (short overview)
Our Intention: Feedback

Interaction Relation (INR)

Physical Proximity Relation (PPR)
Outline (Part II)

Entity Extraction
  What is an Entity?
  What is an Entity Mention?

Relationship Extraction
  What is a Social Relationship?
  Types of Relationships (short overview)
  Our Intention: Feedback

Interaction Relation (INR)

Physical Proximity Relation (PPR)

Perception Relation (PCR)
Outline (Part II)

**Entity Extraction**
- What is an Entity?
- What is an Entity Mention?

**Relationship Extraction**
- What is a Social Relationship?
- Types of Relationships (short overview)
- Our Intention: Feedback

**Interaction Relation (INR)**

**Physical Proximity Relation (PPR)**

**Perception Relation (PCR)**

**Cognition Relation (COG)**
Outline (Part II)

Entity Extraction
  What is an Entity?
  What is an Entity Mention?

Relationship Extraction
  What is a Social Relationship?
  Types of Relationships (short overview)
  Our Intention: Feedback

Interaction Relation (INR)

Physical Proximity Relation (PPR)

Perception Relation (PCR)

Cognition Relation (COG)

An Example
Definition of Entity as per ACE\textsuperscript{1} Guidelines

Entity: An Entity is an object or set of objects in the world.

\textsuperscript{1}Automatic Content Extraction
Definition of Entity as per ACE\textsuperscript{1} Guidelines

Entity: An Entity is an object or set of objects in the world.

Types of Entities:

- **Person**: Individual human being or a group of human beings
- **Organization**: Agencies, Corp. (Organizational structures)
- **Geo-political**: Geo. regions defined by political/social groups
- **Location**: Geographical land-masses, bodies of water etc.
- **Facility**: Buildings and other man-made structures

\textsuperscript{1}Automatic Content Extraction
Our Definition

An Entity is a human being or a group of human beings.
An Entity is a human being or a group of human beings.

Entity: An Entity is an object or set of objects in the world.

Types of Entities:

- **Person**: Individual human being or a group of human beings
- **Organization**: Agencies, Corp. (Organizational structures)
- **Geo-political**: Geo. regions defined by political/social groups
- **Location**: Geographical land-masses, bodies of water etc.
- **Facility**: Buildings and other man-made structures
Definition: A mention is a reference of an entity in text.
Definition: A mention is a reference of an entity in text.

Types of mentions:

- **Name**: [John] was standing near Mudd
**Entity Mention**

**Definition:** A mention is a reference of an entity in text.

**Types of mentions:**

- **Name:** [John] was standing near Mudd
- **Nominal:** He was [the guy wearing a scarf]
Definition: A mention is a reference of an entity in text.

Types of mentions:

- **Name**: [John] was standing near Mudd
- **Nominal**: He was [the guy wearing a scarf]
- **Pronoun**: [He] was the guy wearing a scarf
What is a Social Relationship?

A social relationship is a relationship in which two or more entities relate, communicate or are associated such that for at least one participant, the interaction is deliberate.

Therefore, we are not interested in Social Status (rich, middle-class, poor)
We define the following types of Social Relations:

- **Interaction (INR):** talking, throwing a stone, waving
Types of Social Relationships? (short overview)

We define the following types of Social Relations:

- **Interaction (INR):** talking, throwing a stone, waving
- **Physical Proximity (PPR):** seeing, suicide-bomber killing
We define the following types of Social Relations:

- **Interaction (INR):** talking, throwing a stone, waving
- **Physical Proximity (PPR):** seeing, suicide-bomber killing
- **Perception (PCR):** seeing on TV, Web-cam, magazine
Types of Social Relationships? (short overview)

We define the following types of Social Relations:

- **Interaction (INR):** talking, throwing a stone, waving
- **Physical Proximity (PPR):** seeing, suicide-bomber killing
- **Perception (PCR):** seeing on TV, Web-cam, magazine
- **Cognition (COG):** thinking, loving, missing, supporting
Types of Social Relationships? (short overview)

We define the following types of Social Relations:

- **Interaction (INR):** talking, throwing a stone, waving
- **Physical Proximity (PPR):** seeing, suicide-bomber killing
- **Perception (PCR):** seeing on TV, Web-cam, magazine
- **Cognition (COG):** thinking, loving, missing, supporting
- **SOC-PER:** ACE relation with subtypes Family, Business, Lasting
Our Intention: To get your feedback

Looking for answers to the following questions:

➢ Is the list of social relations we define complete?
Our Intention: To get your feedback

Looking for answers to the following questions:

▶ Is the list of social relations we define complete?
▶ Are the definitions we give clear?
Our Intention: To get your feedback

Looking for answers to the following questions:

- Is the list of social relations we define complete?
- Are the definitions we give clear?
- Can you think of counter-examples for our definitions?
Interaction Relation (INR)

**Definition:** Two entities have an interaction relation if both entities are mutually aware of their *presence* and the *event* taking place between the entities; during or after the event.
Interaction Relation (INR)

Definition: Two entities have an interaction relation if both entities are mutually aware of their *presence* and the *event* taking place between the entities; during or after the event.
Interaction Relation (INR)

**Definition:** Two entities have an interaction relation if both entities are mutually aware of their *presence* and the *event* taking place between the entities; during or after the event.

**Undirected relationship**

1-on-1 phone

**INR**

- **Verbal**
  - Near
  - Far

- **Non-Verbal**
  - Near
  - Far
Definition: Two entities have an interaction relation if both entities are mutually aware of their *presence* and the *event* taking place between the entities; during or after the event.
Verbal Interaction Relation (INR.Verbal)

Interaction through words (dialogue, monologue, email, phone etc.)
Verbal Interaction Relation (INR.Verbal)

Interaction through words (dialogue, monologue, email, phone etc.)

Alan phoned Mary and asked “How is it going?”
Verbal Interaction Relation (INR.Verbal)

Interaction through words (dialogue, monologue, email, phone etc.)

Entity 1

Alan phoned Mary and asked “How is it going?”

Entity 2

INR.Verbal.Far
Non-Verbal Interaction Relation (INR.NonVerbal)

All interactions that do not (primarily) involve words
Non-Verbal Interaction Relation (INR.NonVerbal)

All interactions that do not (primarily) involve words

Television footage showed medical teams carting away dozens of wounded victims
Non-Verbal Interaction Relation (INR.NonVerbal)

All interactions that do not (primarily) involve words

Television footage showed medical teams carting away dozens of wounded victims

Entity 1

Entity 2

INR.NonVerbal.Near
Physical Proximity Relation (PPR)

**Definition:** Entities are said to have a physical proximity relation if:

1. only one entity is aware of the other entity AND
2. both entities are physically proximate
Physical Proximity Relation (PPR)

**Definition**: Entities are said to have a physical proximity relation if:

1. only one entity is aware of the other entity AND
2. both entities are physically proximate

Directed relationship
Physical Proximity Relation (PPR)

**Definition**: Entities are said to have a physical proximity relation if:

1. only one entity is aware of the other entity AND 
2. both entities are physically proximate
Examples of PPR

Alice saw the Rabbit running by her
Examples of PPR

Alice saw the Rabbit running by her

*Alice saw* the *Rabbit* running by her
Examples of PPR

Alice saw the Rabbit running by her
Alice saw the Rabbit running by her PPR

W. Rabbit ran by Alice
Examples of PPR

Alice saw the Rabbit running by her
Alice saw the Rabbit running by her

W. Rabbit ran by Alice
W. Rabbit ran by Alice

No Annotation
Examples of PPR

Alice saw the Rabbit running by her
Alice saw the Rabbit running by her PPR

W. Rabbit ran by Alice
W. Rabbit ran by Alice No Annotation

Dodo and Duck were swimming together
Examples of PPR

Alice saw the Rabbit running by her
Alice saw the Rabbit running by her PPR

W. Rabbit ran by Alice
W. Rabbit ran by Alice No Annotation

Dodo and Duck were swimming together
Dodo and Duck were swimming together INR.NonVerbal.Near
Examples of PPR

Alice saw the Rabbit running by her
Alice saw the Rabbit running by her PPR

W. Rabbit ran by Alice
W. Rabbit ran by Alice No Annotation

Dodo and Duck were swimming together
Dodo and Duck were swimming together INR.NonVerbal.Near

Jack shot Palmer using a long range rifle
Examples of PPR

Alice saw the Rabbit running by her
Alice saw the Rabbit running by her

W. Rabbit ran by Alice
W. Rabbit ran by Alice

Dodo and Duck were swimming together
Dodo and Duck were swimming together

Jack shot Palmer using a long range rifle
Jack shot Palmer using a long range rifle
Definition: Entities are said to have a perception relation if:
1. only one entity is aware of the other entity AND
2. the entities are NOT physically proximate
Perception Relation (PCR)

Definition: Entities are said to have a perception relation if:
1. only one entity is aware of the other entity AND
2. the entities are NOT physically proximate
Perception Relation (PCR)

Definition: Entities are said to have a perception relation if:
1. only one entity is aware of the other entity AND
2. the entities are NOT physically proximate
Perception Relation (PCR)

**Definition**: Entities are said to have a perception relation if:
1. only one entity is aware of the other entity AND
2. the entities are NOT physically proximate

![Diagram showing perception relation with entities A and B, mediums such as Web-cam, TV, and Magazine, and a directed relationship arrow.]
Examples of PCR

Ann was spying on Bill using a hidden camera.
Examples of PCR

Ann was spying on Bill using a hidden camera

Ann was spying on Bill using a hidden camera
Examples of PCR

Ann was spying on Bill using a hidden camera

Ann was spying on Bill using binoculars

Ann was spying on Bill using binoculars
Examples of PCR

Ann was spying on Bill using a hidden camera

Ann was spying on Bill using a hidden camera

Ann was spying on Bill using binoculars

Ann was spying on Bill using binoculars
Examples of PCR

Ann was spying on Bill using a hidden camera

Ann was *spying on Bill using a hidden camera*  
PCC

Ann was spying on Bill using binoculars

Ann was *spying on Bill using binoculars*  
PPR

Ann was talking to Bill on phone, unaware of the fact that Mary was listening in
Examples of PCR

Ann was spying on Bill using a hidden camera

Ann was spying on Bill using binoculars

Ann was talking to Bill on phone, unaware of the fact that Mary was listening in

Ann was . . . fact that Mary was listening in
Cognition Relation (COG)

Definition: Entities are said to have a cognition relation if:

1. an entity is present in the cognitive state of other entity AND
2. relation is NOT INR, PPR or PCR AND
3. entities are associated through knowledge, belief, desire or intention
Cognition Relation (COG)

**Definition:** Entities are said to have a cognition relation if:

1. an entity is present in the cognitive state of other entity AND
2. relation is NOT INR, PPR or PCR AND
3. entities are associated through knowledge, belief, desire or intention
Examples of COG

*Ann knows Obama is the President*  COG.Knowledge
Examples of COG

- Ann knows Obama is the President  
  COG.Knowledge
- Sources report that there’s a boy in the balloon  
  COG.Belief
Examples of COG

Ann knows Obama is the President

Sources report that there’s a boy in the balloon

Ann wanted to support Obama’s health reform plans

COG.Knowledge

COG.Belief

COG.Desire
Examples of COG

Ann knows Obama is the President COG.Knowledge

Sources report that there’s a boy in the balloon COG.Belief

Ann wanted to support Obama’s health reform plans COG.Desire

Ann decided to support Obama’s health reform plans COG.Intention
Examples of COG

Ann knows Obama is the President COG.Knowledge

Sources report that there’s a boy in the balloon COG.Belief

Ann wanted to support Obama’s health reform plans COG.Desire

Ann decided to support Obama’s health reform plans COG.Intention
An Example

Alice in Wonderland
Entities: Alice, White Rabbit, Mary Ann, Duchess

Relations:
- PPR: Rabbit enters the scene, Alice overhears
Annotations

**Entities:** Alice, White Rabbit, Mary Ann, Duchess

**Relations:**
- PPR: Rabbit enters the scene, Alice overhears
- COG.Belief: Rabbit believes the Duchess is going to kill him
- COG.Belief: Rabbit mistakes Alice for Mary Ann
Annotations

Entities: Alice, White Rabbit, Mary Ann, Duchess

Relations:
- PPR: Rabbit enters the scene, Alice overhears
- COG.Belief: Rabbit believes the Duchess is going kill him
- PPR: Rabbit and Alice talk
Entities: Alice, White Rabbit, Mary Ann, Duchess

Relations:
- PPR: Rabbit enters the scene, Alice overhears
- COG.Belief: Rabbit believes the Duchess is going kill him
- PPR: Rabbit and Alice talk
- COG.Belief*: Rabbit mistakes Alice for Mary Ann
Annotations

Entities: Alice, White Rabbit, Mary Ann, Duchess

Relations:
- PPR: Rabbit enters the scene, Alice overhears
- COG.Belief: Rabbit believes the Duchess is going kill him
- PPR: Rabbit and Alice talk
- COG.Belief*: Rabbit mistakes Alice for Mary Ann
- Any other?
Cognitive State diagram

PPR

Is this a problem?

COG.Belief
Cognitive State diagram

Is this a problem?
Cognitive State diagram

Is this a problem?

PPR

COG.Belief
We would like to thank David Elson for useful comments and ideas.