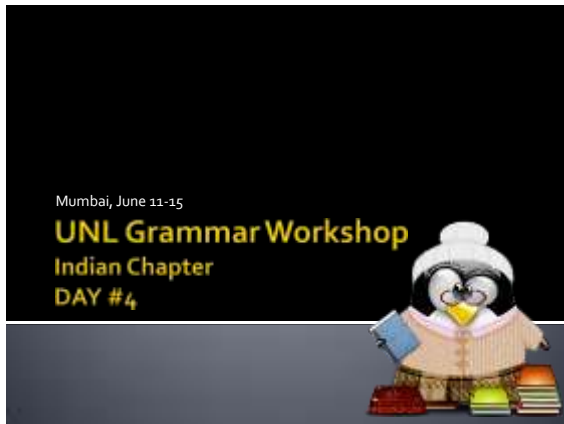
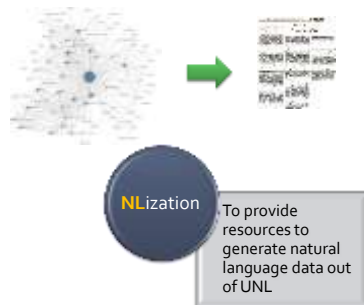




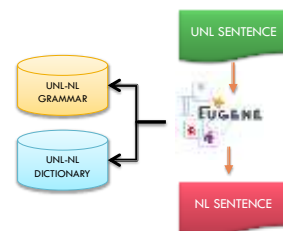
## Summarizing

- Corpus
- NL-UNL (Analysis) Dictionary
- UNL-NL (Generation) Dictionary
- Inflectional grammar (for generation)
- NL-UNL (Analysis) Grammar

## The UNL System



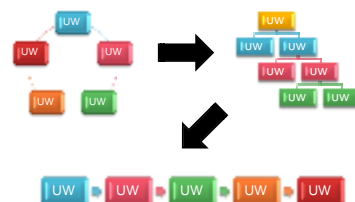
## EUGENE



## Transformation Rules

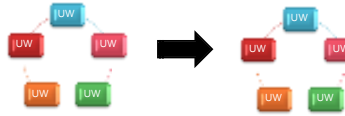


## Natural Language Generation



## NETWORK-TO-NETWORK (NN)

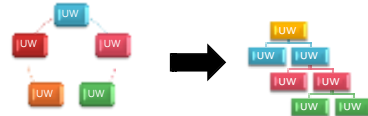
### Transformation Rules



| ACTION           | RULE                             |
|------------------|----------------------------------|
| ADD RELATION     | $SEM(A;B) := +SEM(C;D);$         |
| DELETE RELATION  | $SEM(A;B) := -SEM(C;D);$         |
| REPLACE RELATION | $SEM(A;B) := SEM(C;D);$          |
| MERGE RELATION   | $SEM(A;B) SEM(C;D) := SEM(E;F);$ |
| DIVIDE RELATION  | $SEM(A;B) := SEM(C;D) SEM(E;F);$ |

## NETWORK-TO-TREE (NT)

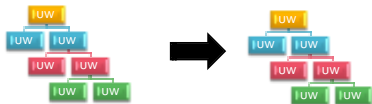
### Transformation Rules



| ACTION  | RULE                    |
|---------|-------------------------|
| REPLACE | $SEM(A;B) := SYN(C;D);$ |

## TREE-TO-TREE (TT)

### Transformation Rules

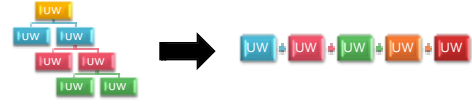


| ACTION           | RULE                             |
|------------------|----------------------------------|
| ADD RELATION     | $SYN(A;B) := +SYN(C;D);$         |
| DELETE RELATION  | $SYN(A;B) := -SYN(C;D);$         |
| REPLACE RELATION | $SYN(A;B) := SYN(C;D);$          |
| MERGE RELATION   | $SYN(A;B) SYN(C;D) := SYN(E;F);$ |
| DIVIDE RELATION  | $SYN(A;B) := SYN(C;D) SYN(E;F);$ |

| ACTION      | RULE                      |
|-------------|---------------------------|
| ADD NODE    | $SYN(A;B) := SYN(A;B;C);$ |
| DELETE NODE | $SYN(A;B) := SYN(A);$     |

## TREE-TO-LIST (TL)

### Transformation Rules



| ACTION  | RULE               |
|---------|--------------------|
| REPLACE | $SYN(A;B) := [C];$ |

## LIST-TO-LIST (LL)

### Transformation Rules



| ACTION  | RULE                                    |
|---------|-----------------------------------------|
| ADD     | $(A) := (A)(B);$ or<br>$(A) := (B)(A);$ |
| DELETE  | $(A) := -(A);$                          |
| REPLACE | $(A) := (B);$                           |
| MERGE   | $(A)(B) := (C);$                        |
| DIVIDE  | $(A) := (B)(C);$                        |

## Examples

### English Generation Grammar (1)

- SOURCE (UNL)
  - "asdfghij"
- TARGET (English)
  - "asfghij"
- RULES
  - No rule is necessary

### English Generation Grammar (2)

- SOURCE (UNL)
  - book
- TARGET (English)
  - book
- RULES
  - No rule is necessary

### English Generation Grammar (3)

- SOURCE (UNL)
  - book.@indef
- TARGET (eng)
  - a book
- RULES
  - (N,@indef,%x):=("a")(" ")(%x,-@indef);

### English Generation Grammar (5)

- SOURCE (UNL)
  - book.@distal
- TARGET (eng)
  - that book
- RULES
  - (N,SNG,@distal,%x):=("that")(" ")(%x,-@distal);

### English Analysis Grammar (7)

- SOURCE (UNL)
  - book.@all
- TARGET (eng)
  - All books
- RULES
  - (N,SNG,@all,%x):=("all")(" ")(%x,-@distal);
  - (NUM,PLR,FLX,^inflected,%x):(!FLX,-FLX,+inflected,%x);

### English Analysis Grammar (11)

- SOURCE (eng)
  - beautiful.@plus
- TARGET (UNL)
  - very beautiful
- RULES
  - (J,@plus,%x):=("more")(" ")(%x,-@plus);

## English Analysis Grammar (13)

- SOURCE (UNL)
  - book.@def.@pl
- TARGET (UNL)
  - The books
- RULES
  - (N,@def,%x):=("the")(" ")(%x,-@def);
  - (N,@pl,^PLR,%x):=(-NUM,+NUM=PLR,-@pl,%x);
  - (NUM,PLR,FLX,^inflected,%x):=(!FLX,-FLX,+inflected,%x);

## TASK #6

- Goal
  - To create a UNL-NL grammar to generate the corpus from UNL into your native language from sentences 1 to 17