The Rise of the (Modelling) Bots: Towards Assisted Modelling via Social Networks

Sara Perez-Soler, Esther Guerra, Juan de Lara, Francisco Jurado
2017

Presented by Laura Walsh

Overview

1. Background & Motivation

2. Contributions & Goals

3. Natural Language Processing

4. SOCIO Prototype

5. Preliminary Evaluation

6. Strengths and Weaknesses

7. Conclusion & Discussion

Background & Motivation

70% of American citizens are users of a social network.

Can we leverage the familiarity and existing use of social networks to help us model?

- -

Repurpose existing social media apps to facilitate discussions about modelling / lightweight modelling itself within the application

The Idea

- Users can send messages to each other

- Users can send messages to a 'modelling bot' who will process their commands using Natural Language Processing

- Modelling bot will create metamodel based on user commands

Desirable properties:

Lightweight • User-friendly • Promotes collaboration • Traceable design decisions

The Idea

Benefits:
- Mild learning curve
- Minimal computer science experience needed to model
- Domain experts can collaborate with modellers/engineers
- Modelling can be done anywhere and at any time, easily

Uses:
- In the educational domain: to allow groups of students to collaborate on modelling projects
- For crowdsourcing modelling decisions
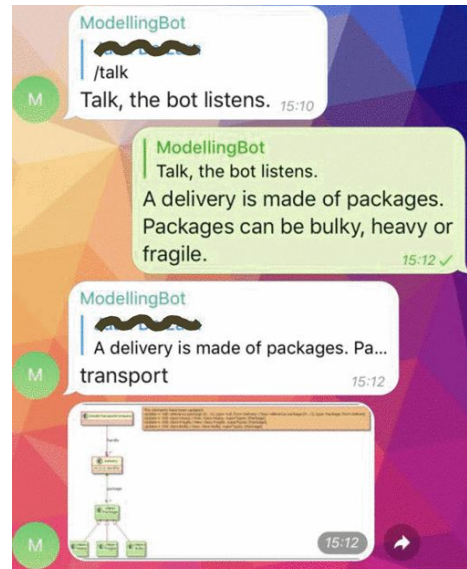- For quick prototyping
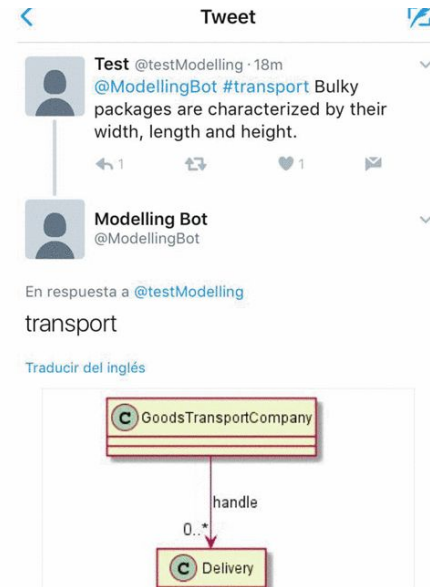
Interaction with the Bot / Other Users
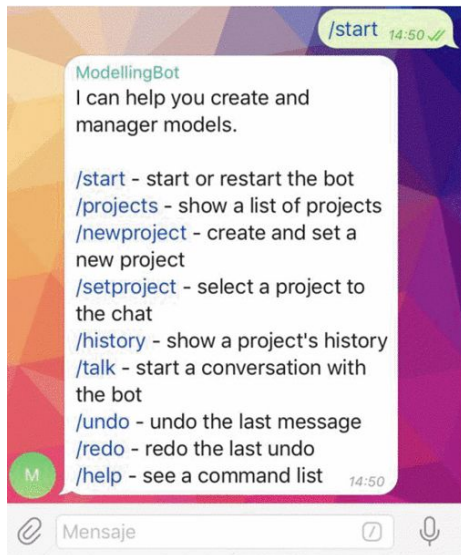
(a) initializing the bot (Telegram)

(b) discussion and project creation

(c) providing NL descriptions

(d) interaction via Twitter

Goals

- Modelling bot will understand natural language commands and descriptions

- Design decisions should be traceable

- Multiple social networks should be supported

- Both meta-modelling and modelling should be supported

- Collaboration protocols should be customizable

- System should be interoperable with common modelling frameworks (e.g. EMF)

Goals

- Modelling bot will understand natural language commands and descriptions ✔

- Design decisions should be traceable ✔

- Multiple social networks should be supported ✔

- Both meta-modelling and modelling should be supported ✔

- Collaboration protocols should be customizable

- System should be interoperable with common modelling frameworks (e.g. EMF) ✔

✔ = basic functionality currently implemented

Contributions

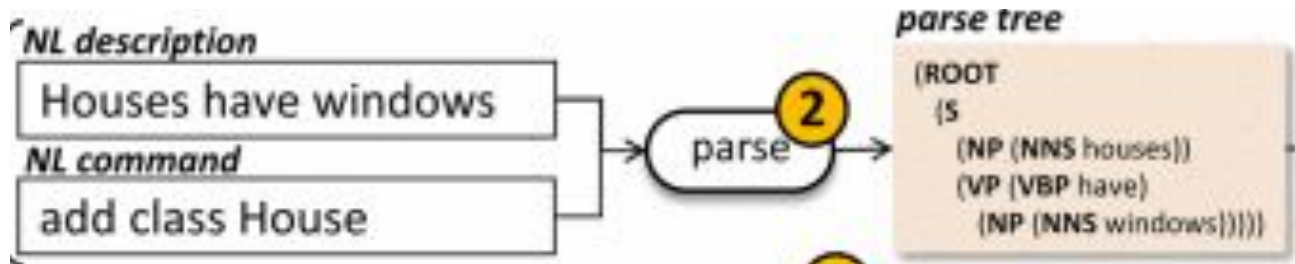1. Framework / Methodology
2. Working prototype (SOCIO)
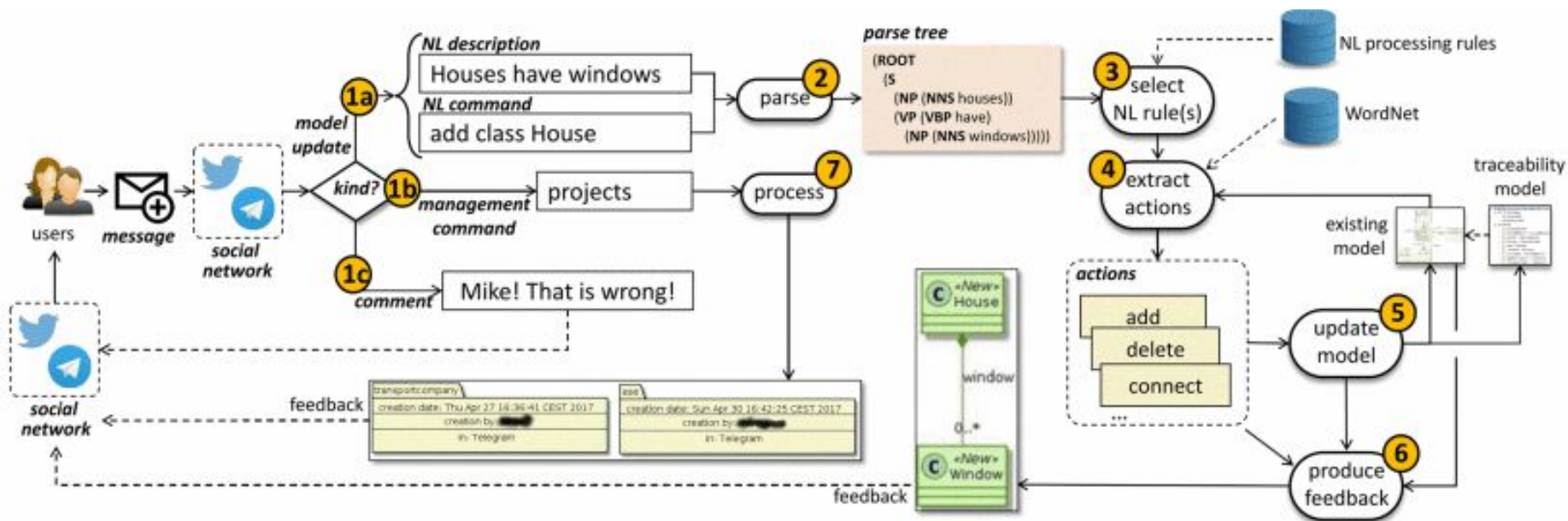
Natural Language Processing

- Uses the Stanford NL parser
- Creates a parse tree with the grammatical relations of the message
- Uses WordNet to find synonyms

E.g. *"Houses have windows"*
Nouns (plural): Houses, Windows
Verb in Present Tense: have

NL description
Houses have windows

NL command
add class House

parse 2

parse tree
(ROOT
  (S
    (NP (NNS houses))
    (VP (VBP have)
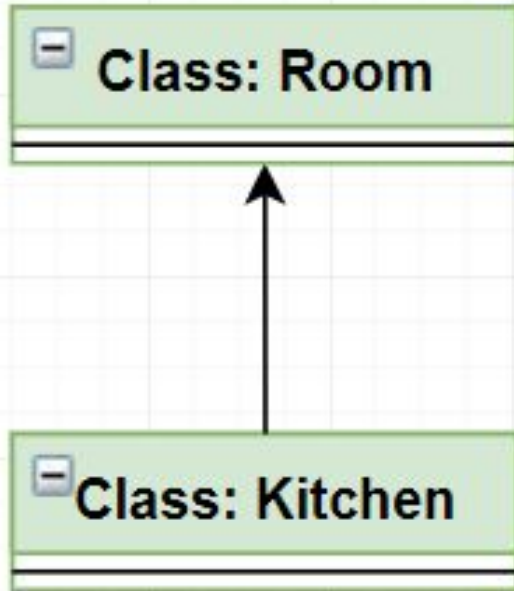   (NP (NNS windows))))

Natural Language Processing

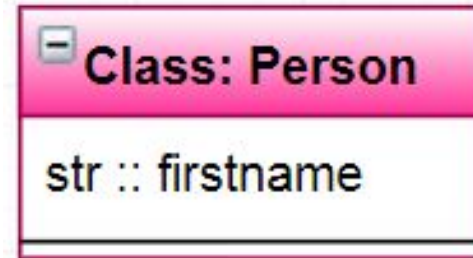6 rules that govern Natural Language Processing

1. Verb *to be*

2. Verb *to have*

3. Transitive verb

4. Verb *contain*

5. Add

6. Remove
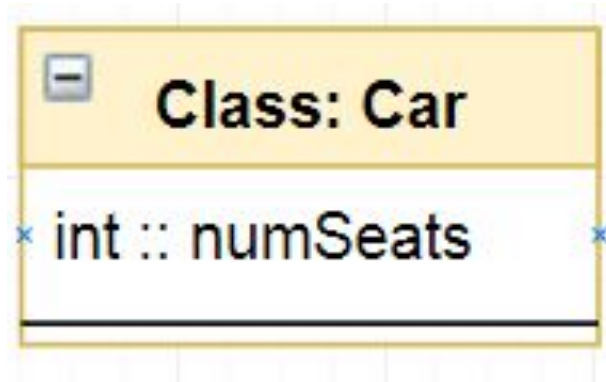
1. Verb *to be*

Example 1: "Kitchen is a room"

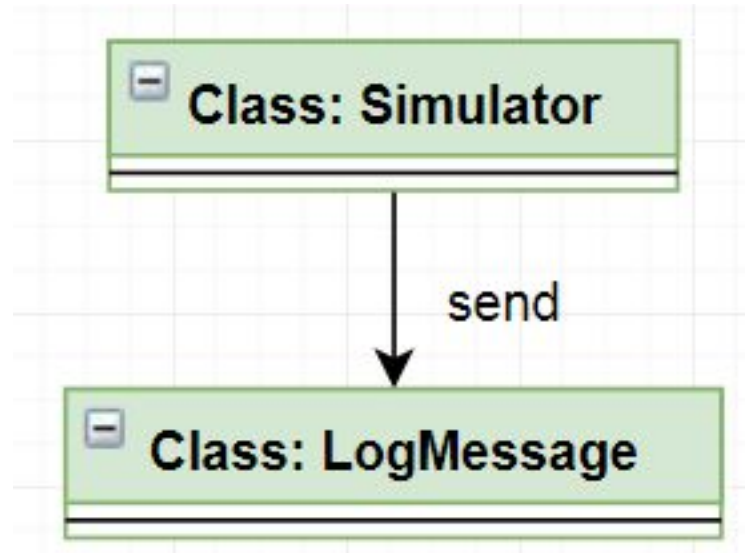Example 2: "First name is a string"

2. Verb *to have*

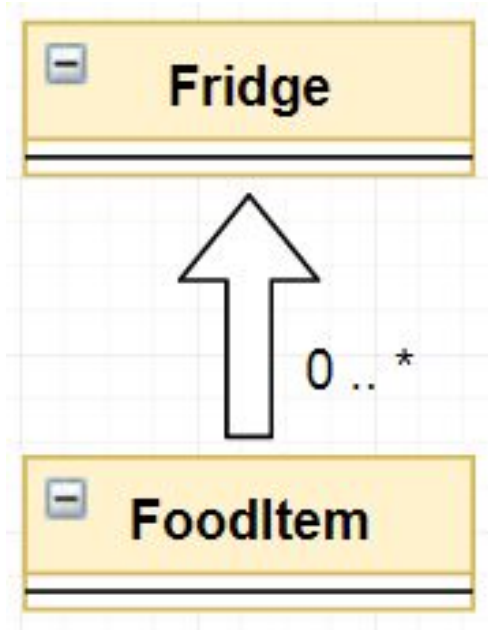Example: "Car has a number of seats"

3. Transitive Verb

Example: "The simulator should send log messages"

4. Verb *contain*

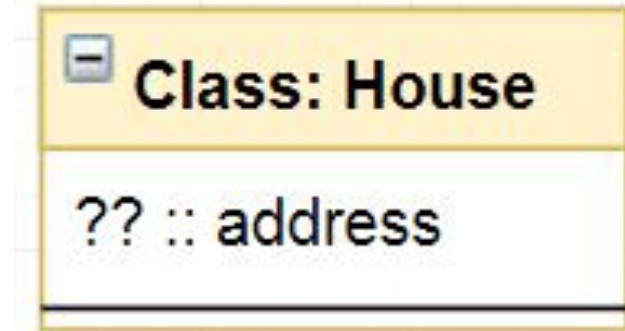Example: "A fridge contains food items"
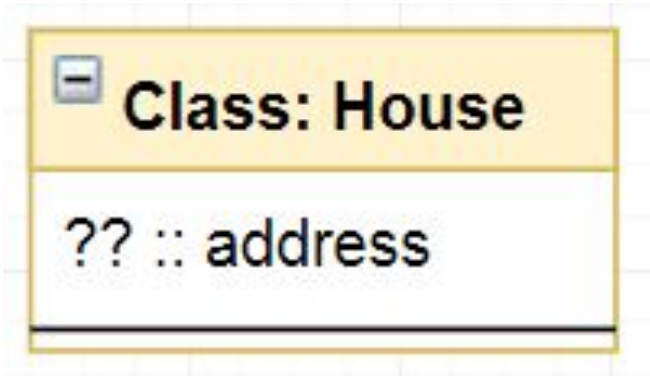
5. Add

Example 1: "Add house"

Example 2: "Add address to house"
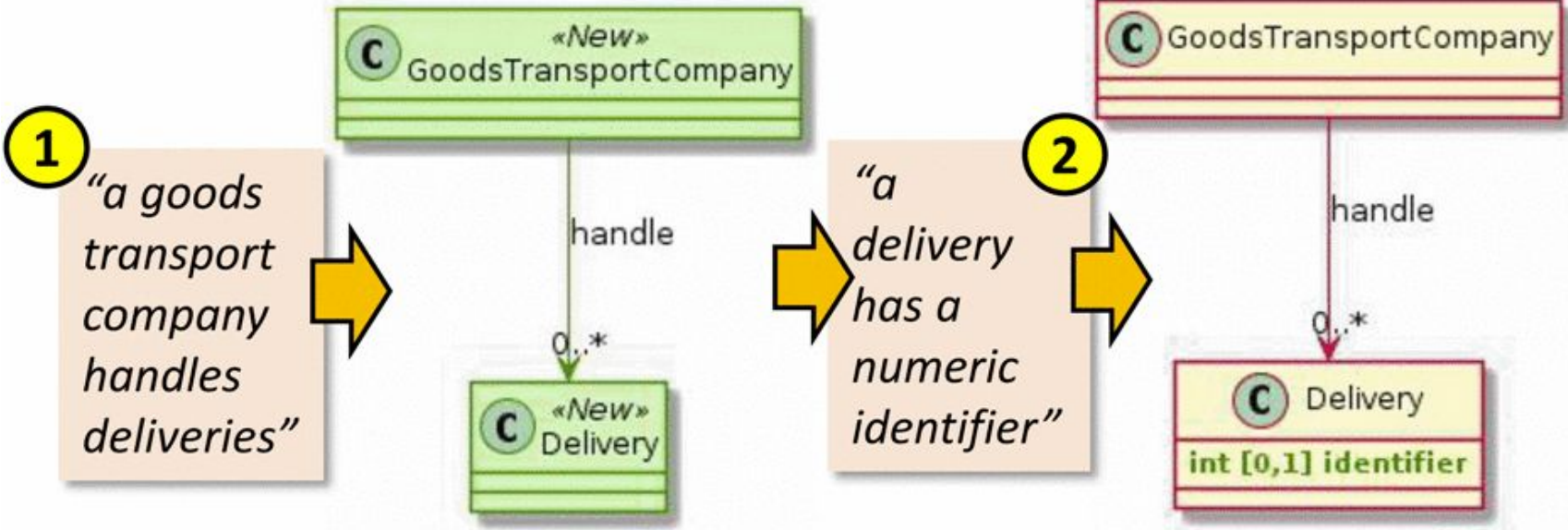
6. Remove

Example: "Remove address from house"

Model Update Actions

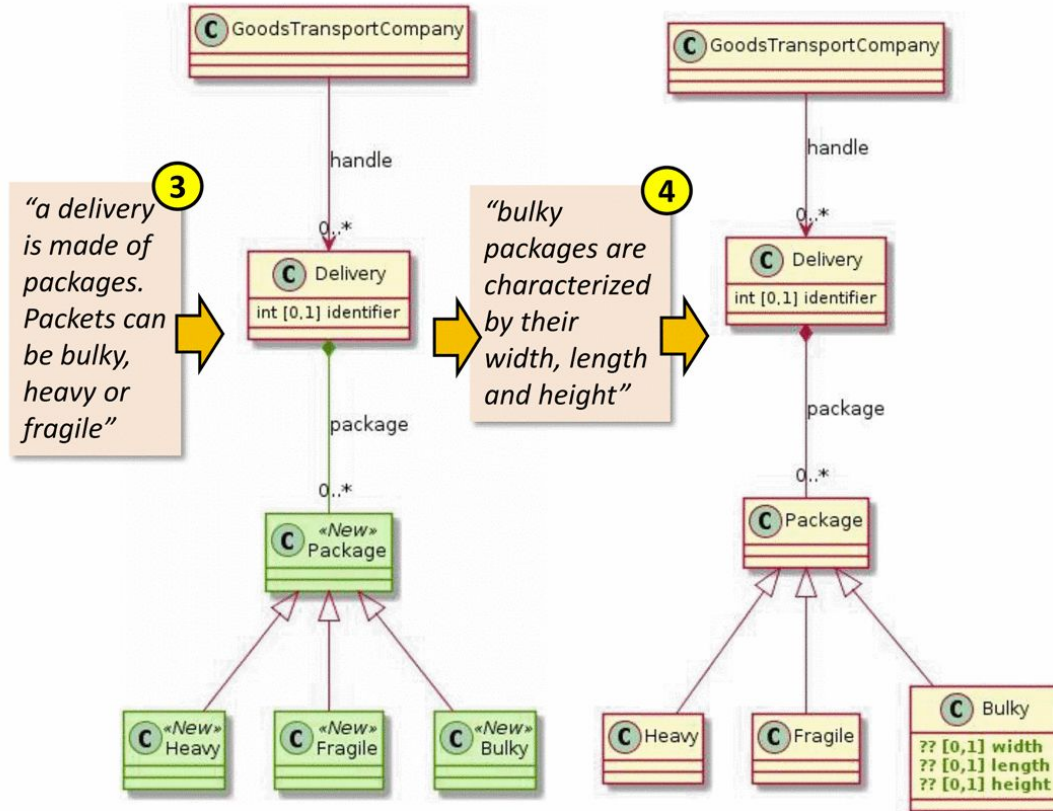9 actions that can be triggered by the previous Natural Language commands

1. Add class
2. Make class abstract or concrete
3. Set parent class
4. Remove parent
5. Add attribute
6. Add reference
7. Add/modify attribute type
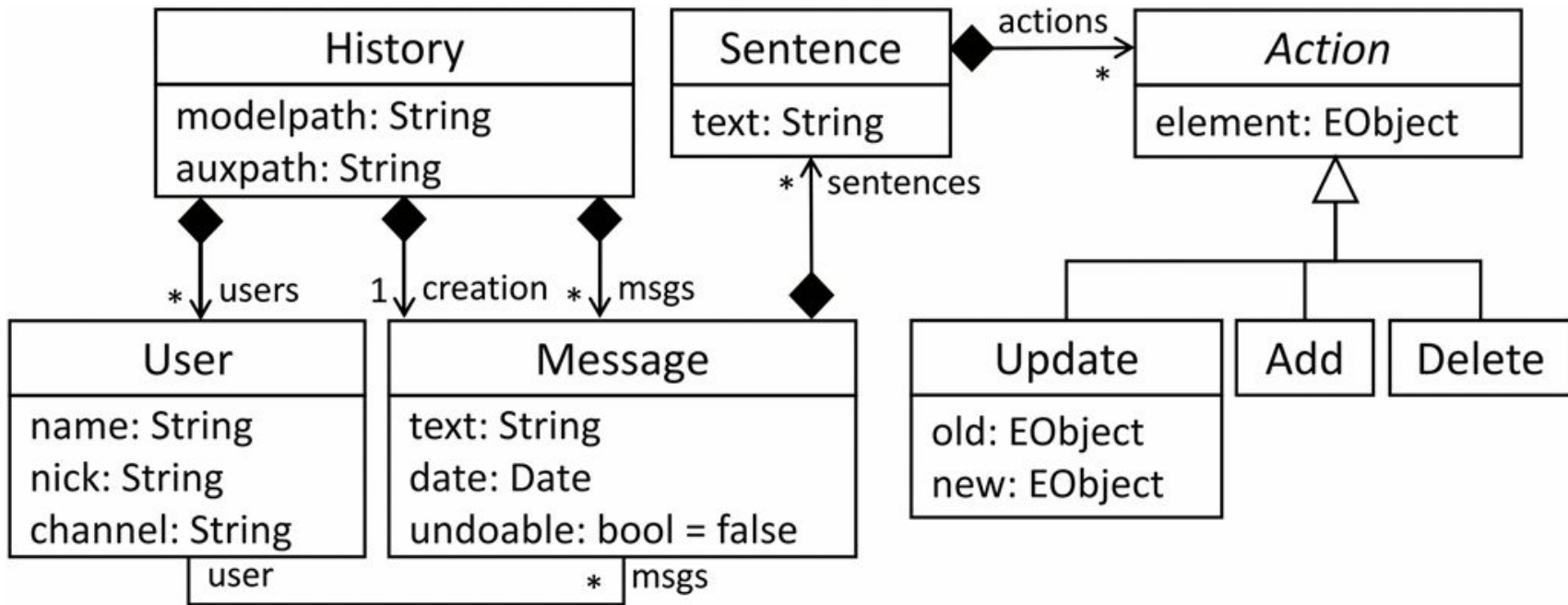8. Remove class
9. Remove attribute

Example Metamodel Creation

Example Metamodel Creation

Traceability

Where are these models stored? How much space do they require?

SOCIO (assisted modelling through social networks)
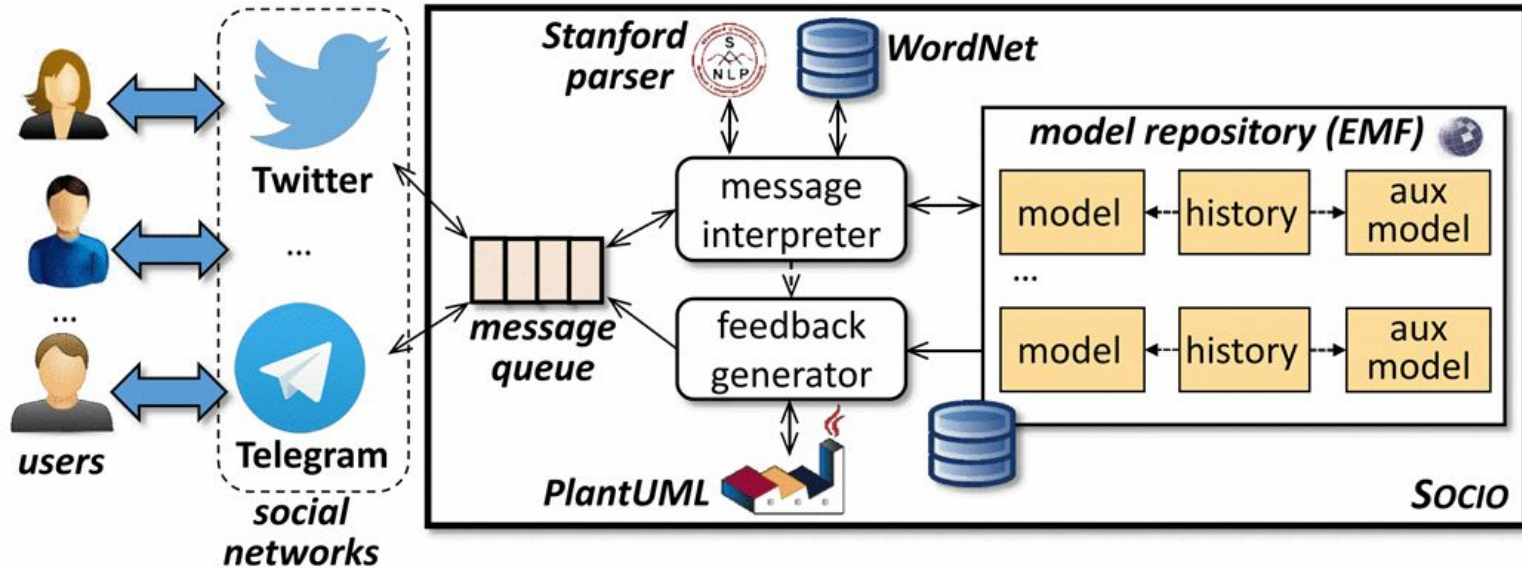
- Currently supports Twitter and Telegram
- Bot uses Stanford Parser and WordNet for NLP
- Models are stored using EMF

Preliminary Evaluation

- 10 participants in 4 Telegram groups (2 groups of two people, 2 groups of three people)
- Asked to create a meta-model for e-commerce within 15 minutes using SOCIO, then complete a questionnaire.

Questionnaires:

- System Usability Scale (SUS) - de-facto standard to measure system usability
- Custom questionnaire for SOCIO

System Usability Scale

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

Score: **74%** (good usability)

Custom Questionnaire

75%   1.   Suitability of NL to build models vs. using an editor

62.5% 2.   Ability of the bot to correctly interpret Natural Language

60%   3.   Sufficient functionality in the command set

75%   4.   Whether they liked embedding a modelling tool in a social network, or if they would prefer a separate collaborative tool

Strengths

- Very novel idea with applications in education / prototyping / lightweight modelling in general

- Great use of examples and graphics to better describe concepts

- Good description of their evaluation (sample size, demographics, etc)

- Aware of the limitations of their evaluation / future work to be done

Weaknesses

- Not enough detail given on how their system is actually implemented

- Viability of their idea is still unconfirmed and much more work is needed before system would be usable

Conclusion

- Very novel idea for lightweight modelling using social network applications
- Working prototype tool SOCIO as proof of concept
- Preliminary evaluation shows encouraging results

Future Work:

- Add customizable collaboration protocols
- Support model building
- Support querying the model design evolution
- Speech recognition for modelling
- Increasing scalability of bot feedback
- … among other things!

Discussion

1. Do you think that this approach to modelling could actually be used?
   - Is this something YOU could see yourself using for modelling?

2. Can this technique be used to create large models?
   - How scalable is it, what is the upper limit on the size of model that can be developed?

3. Overall thoughts on the paper?