Modelling Requirements for Content Recommendation Systems

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Introduction

Introduction

- A particular trait of Online Social Network (OSN) is that behavior of one user has an impact on the behavior of other users and of the system itself
  - When a user shares an event type, the users friends have a choice: they can decide to reply to that event type or not
    - This decision has an impact on the information that is exchanged on the system
  - We can also observe that the amount and the order in which the event types are notified to the users vary depending on the OSNs

Introduction

On OSNs, a user switches roles constantly between content generator and content receiver

- The user is generating instances of different entities, depending on the role she has:
  - A generator generates instances of a “post”, while the receiver generates instances of a “reply”
- A RS, which needs to do content recommendation, needs to see these roles as separate

Introduction

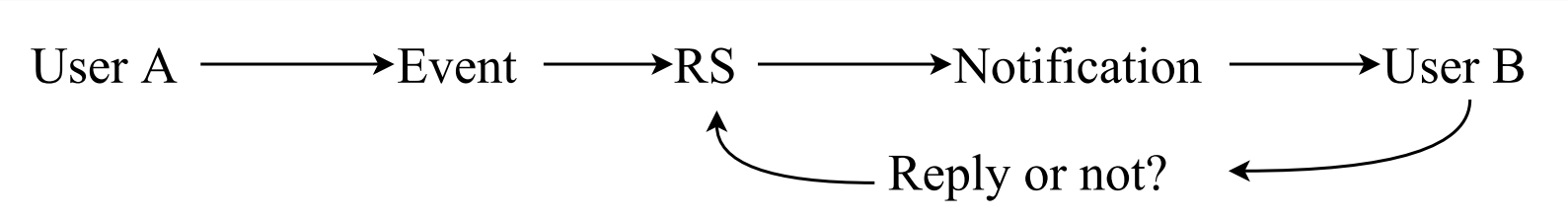
- Consider 2 users, A and B, "friends" on an OSN
- A shares something on the OSN
- The OSN has to decide if the event type should be notified to B
- If it is, then B has to decide whether to reply to the event type

Example

If A shares a photo on the OSN, and if the photo is notified to B, then B has to decide whether she will like, or comment the photo

Introduction

- If B decides to reply to the event type, then her reply amounts to an event type, and she now acts as generator, that is, if she replies, then User B has generated an event to which other users may choose to reply
- Hence, the mechanism goes on



Research Question and Methodology

Research Questions

1. How can we represent the requirements for RS in one single i* diagram?
2. What new concepts and/or relations do we need to use together with those of i* to show the dynamics represented in Figure 1?

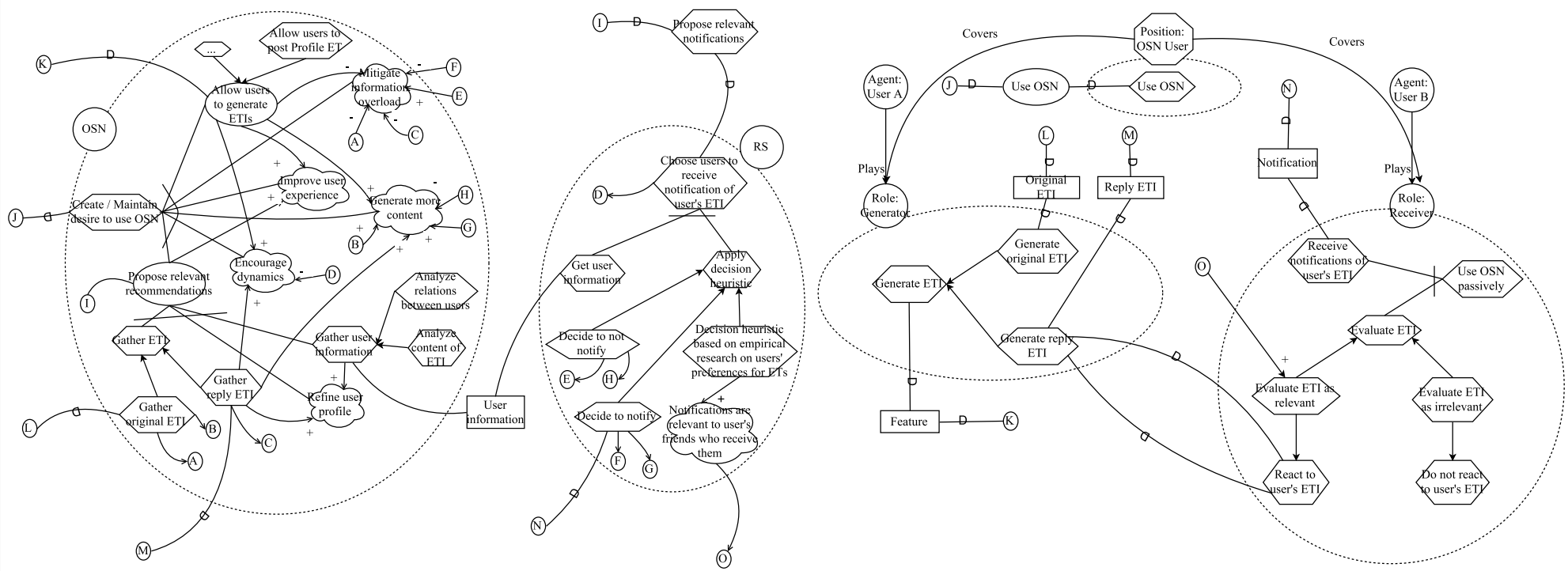
Research Methodology

In order to address these questions, we apply the following methodology:

1. We construct the base layer using i*
    - It represents what happens on an OSN, but from a static point of view
2. We construct the second layer representing the dynamic aspects of OSN, using Petri Nets
    - We build this layer by analyzing and identifying what happens when a user shares a post on the OSN
3. We connect both layers by lifting up i* symbols to the Petri Net layer

Contribution: The Layers and the Connection Between Them

i* Layer: Strategic Rationale Model



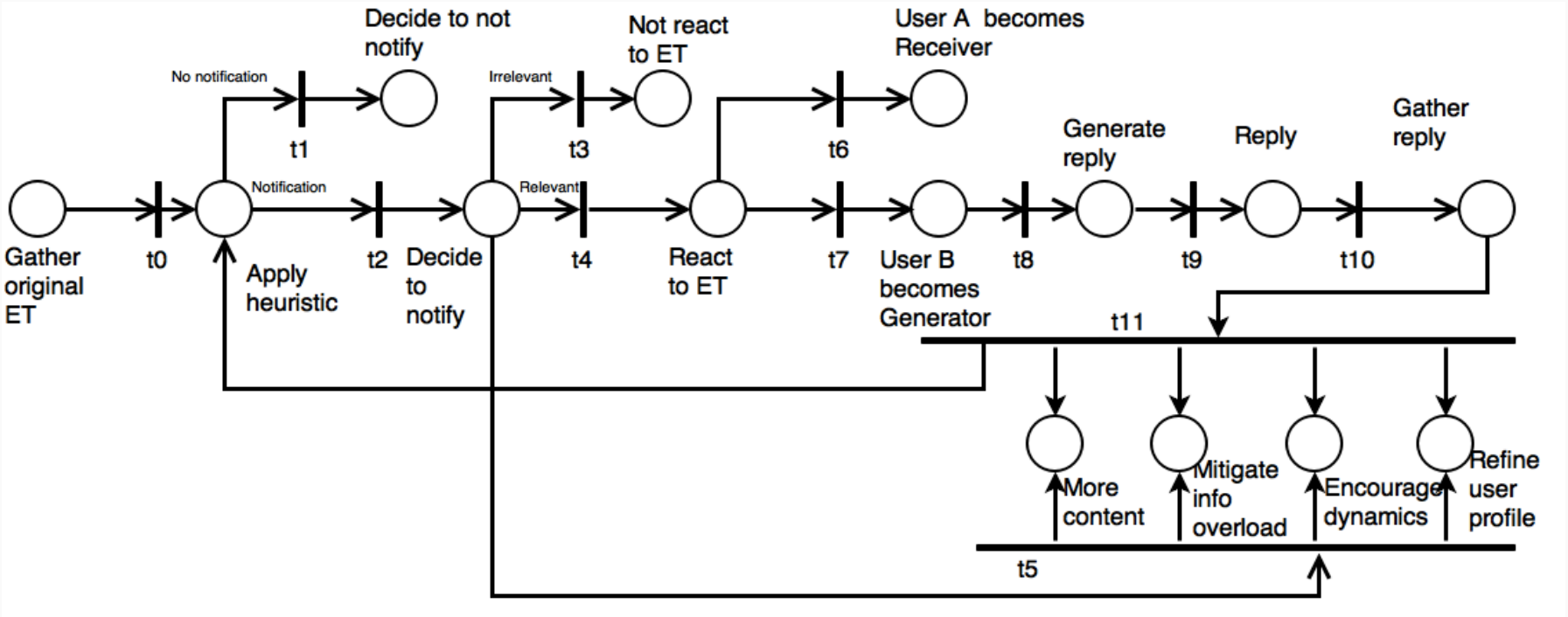
Petri Net Layer

- A Petri net is a particular kind of directed graph, together with an initial state called the initial marking, M_0 [1]
- Petri net consists of two kinds of nodes: (i) places, and (ii) transitions

Graphically,

- k black dots (tokens) are represented in place p
- A marking is designated by M, an m-vector, where m is the total number of places
- The p^{th} component of M, indicated by $M(p)$ is the number of tokens in place p

Petri Net Layer



Connection Between Layers

How do these layers connect?

- The base layer represents the various elements that can occur in an OSN
- The 2^{nd} layer represents the dynamic found in the content recommendation context of an OSN and is triggered by the sharing of an original event type

Connection Between Layers

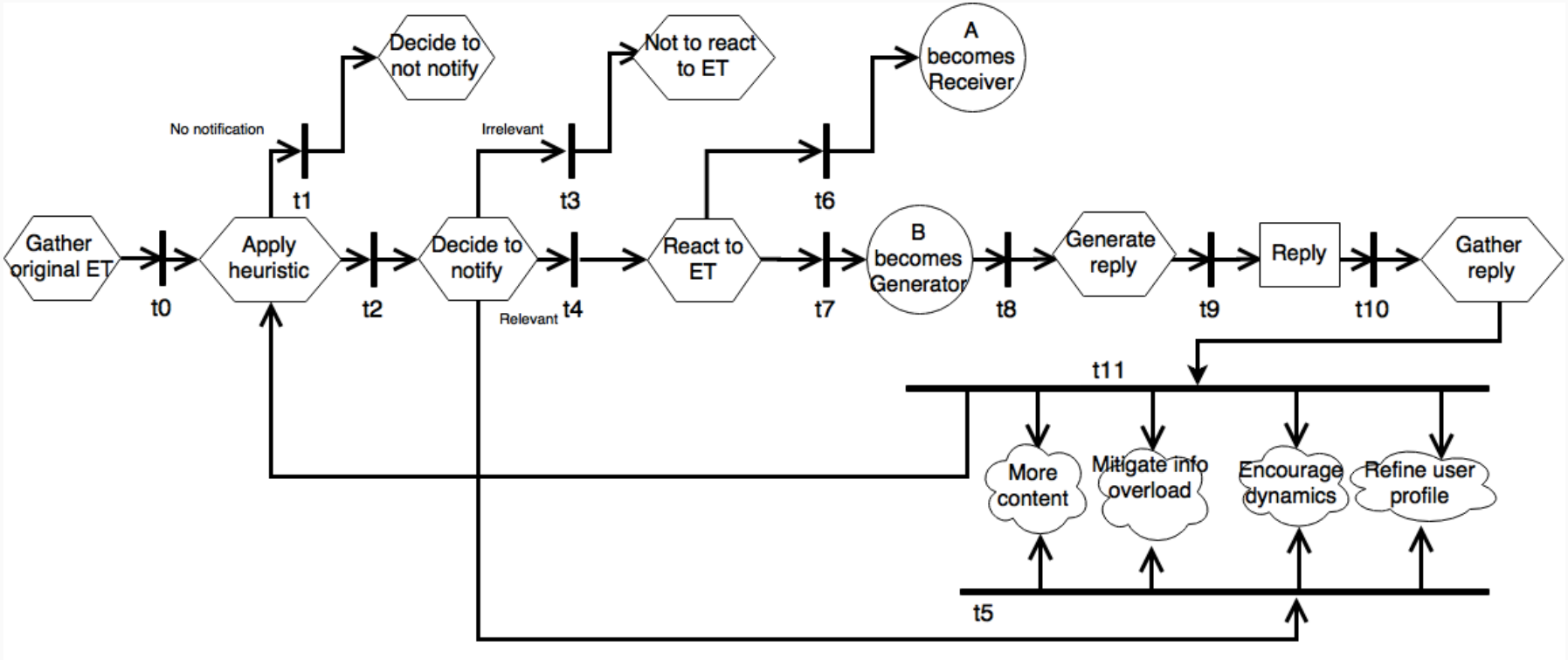
Graphically, the connection occurs as follows:

- Once the trigger happens, the symbols of the base layer lift up to the 2^{nd} layer
- We replace the circles of the Petri Nets with the corresponding symbol of i*

Connection Between Layers

- Hence, the model reads more easily; because we directly see to what symbol the circles of the Petri Net correspond
- Nevertheless, we do not insert new symbols or new concepts
- All the symbols and concepts are known and belong to the i* or Petri Net languages
- We just use the Petri Net formalism to sequence the i* symbols

Connection Between Layers



Discussion

Discussion

- The motivating problem of this paper was the modelling of requirements for content recommendation on OSNs
  - We aimed at modelling the mechanism represented in Figure 1
- We noticed that the original i* did not allow us to model the dynamics observed on OSNs
- We also know that Petri Nets are a nice way to simulate the dynamic behavior of a system [1]
- We combined these two standards, using a layer mechanism to model, in one diagram, the requirements of a content RS

Discussion

The benefits of our approach are threefold

1. We do not introduce another extension, any new concepts, to an existing language. Hence, the use of our proposal does not require any new learning
2. The layer mechanism allows us to manage the complexity
3. The nature of our approach (the use of layers) allows us to extend the scope of the models without any difficulty

Discussion

The limitations of our approach are threefold

1. The diagrams show “one instance” of the mechanism
2. We show the interaction between two users
3. The distinction between user roles is limited to what they do

Conclusion

Conclusion

- We believe i* is appropriate for the modeling of OSN requirements
- However, as mentioned above, the existing concepts in i* do not allow us to model the dynamics observe in the use of OSNs
- Hence, we proposed an add-on to the existing framework, by introducing a second layer; a Petri Net layer modelling the dynamics observed in OSNs

Future Work

Future work will consist in addressing the limitations we raised above; more specifically we aim at providing a more general model, taking into account:

1. The various mechanisms an individual user can be involved in
2. The several instances of mechanisms that can exist

Thank you

Thank you for your attention!

References


T. Murata, “Petri nets: Properties, analysis and applications,” *Proceedings of the IEEE*, vol. 77, no. 4, pp. 541–580, 1989.