A Case Study in Stakeholder-oriented Goal-modeling Framework

Jipeng Wu Eryu Ding Bin Luo

Software Institute
Nanjing University

ICSESS Presentations, 2014

Outline

Outline

Why We Presented SoF

- We applied goal methods in a RE process. To guide a RE process, we presented a possible solution—— SoF(Stakeholder-oriented Goal Modeling Framework).
  - Goal methods
    - diverse, but discrete and fragmental
    - rely on a certain context
  - RE process
    - consistent and monolithic
    - not reply on a certain context. Because it is context itself.

Why We Presented SoF

- We do need these methods, they are the core of goal-based RE, but they are not enough to compose a complete RE process
- On the abstraction level of RE process, the most important RE concerns are:
  - a general workflow and details of each step
  - how to build models and other RE artefacts
  - a way to obtain initial goals
  - a mechanism to ensure correctness of goal-reasoning results

Features of SoF

- Goals acquition
  1. scenario-based interviews with stakeholders
  2. a structured scenario description to organize the interview results
- Goal modeling
  1. a KAOS-like top-down decomposed goal tree model
  2. goal models with RWS-style annotations for stakeholder validation.
- Atomicity of some Processes
  1. Acquition, elaboration and validation of the same goal are non-interruptible processes.
  2. During an atomic activity, the goal is inaccessible.
  3. Input goals of an atomic activity should be output goals of another atomic activity or initial goals.
  4. Thus the correctness of each single atomic activity ensures the correctness of the whole goal reasoning process.

Outline

KAOS Goal Model

- KAOS [van Lamsweerde, 1995]
  1. Although KAOS is a complete RE approach, we are concerned only with its goal model.
  2. KAOS goal model defines some meta-concepts—goal, action, agent, entity and event, which can be visualized as nodes.
  3. The edges between nodes capture the semantic links between such abstractions.
     1. Two basic link types——AND/OR.
     2. Extended link types: Contributes(+), ContributesStrongly(++), Conflicts(-), and ConflictsStrongly(–).

Real World Scene Annotation

- Real World Scenes [Haumer, 1998]
  1. Current system should be captured in the form of rich media(e.g., taking photos, recording videos). The observation results are called Real World Scene.
  2. The observation results should be linked to goals, in order to elaborate and validate goals in the follow-up work.
  3. RWS annotated the goal model with views of stakeholders(1.agree, 2.not agree, 3.add more goals and 4.no position), which facilitates review and validation and finally conforms the goal model to the real world scene.

Outline

SoF Elaboration Activity

1. SoF combines requirements acquition, requirements elaboration reasoning and requirements validation as one atomic activity, which is called *SoF Elaboration Activity*.
2. Each successful *SoF Elaboration Activity* includes the following phases:
   1. interviews with stakeholders, updating *"Scenario Description"*
   2. elaborating goal models
   3. validation interview
3. Before all the steps of the *SoF Elaboration Activity* of one requirement have been finished, it is not allowed that the *SoF Elaboration Activity* of another requirement is initiated.

Activity Diagram of SoF Process

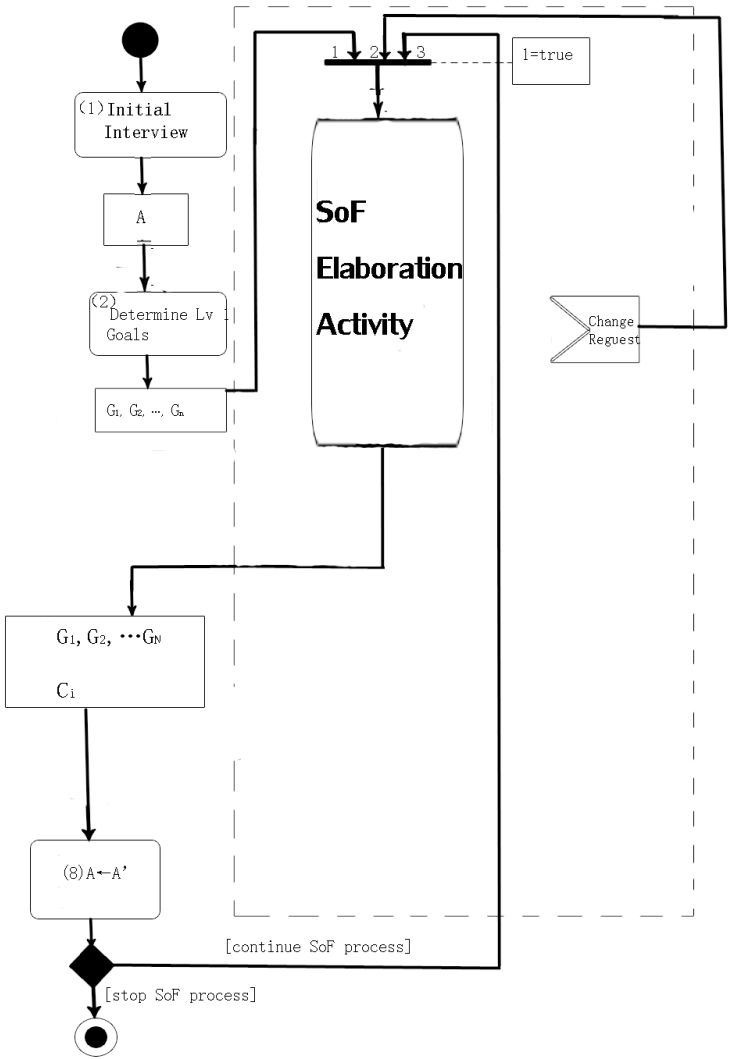

Figure : Activity Diagram of SoF Process

Detailed Activity Diagram of SoF Process

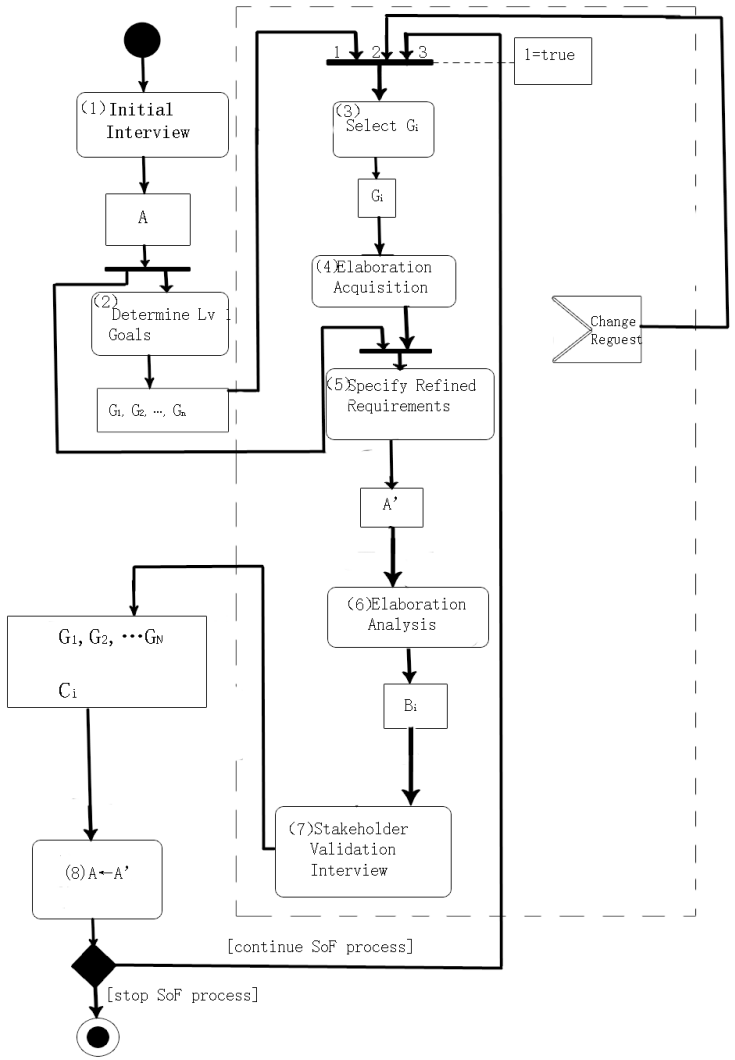

Figure : Activity Diagram of SoF Process

Detailed Activity Diagram of SoF Process

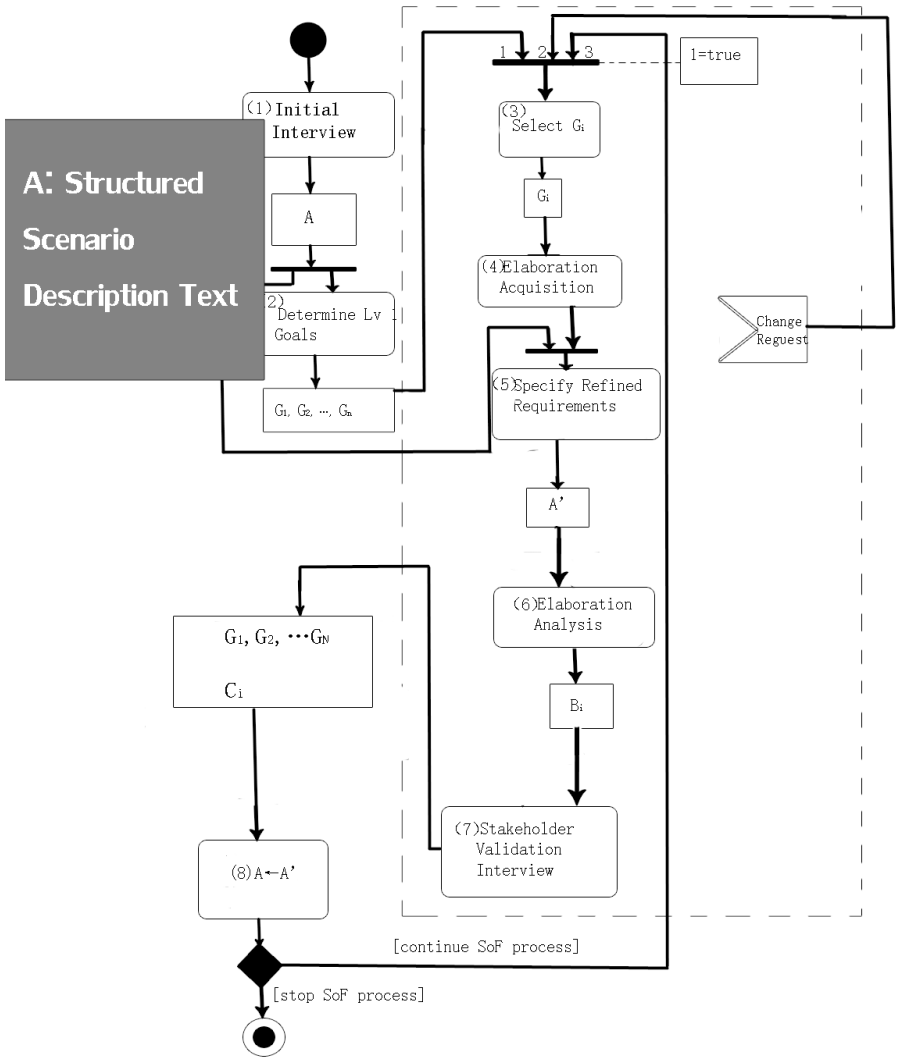

Figure : Activity Diagram of SoF Process

Detailed Activity Diagram of SoF Process

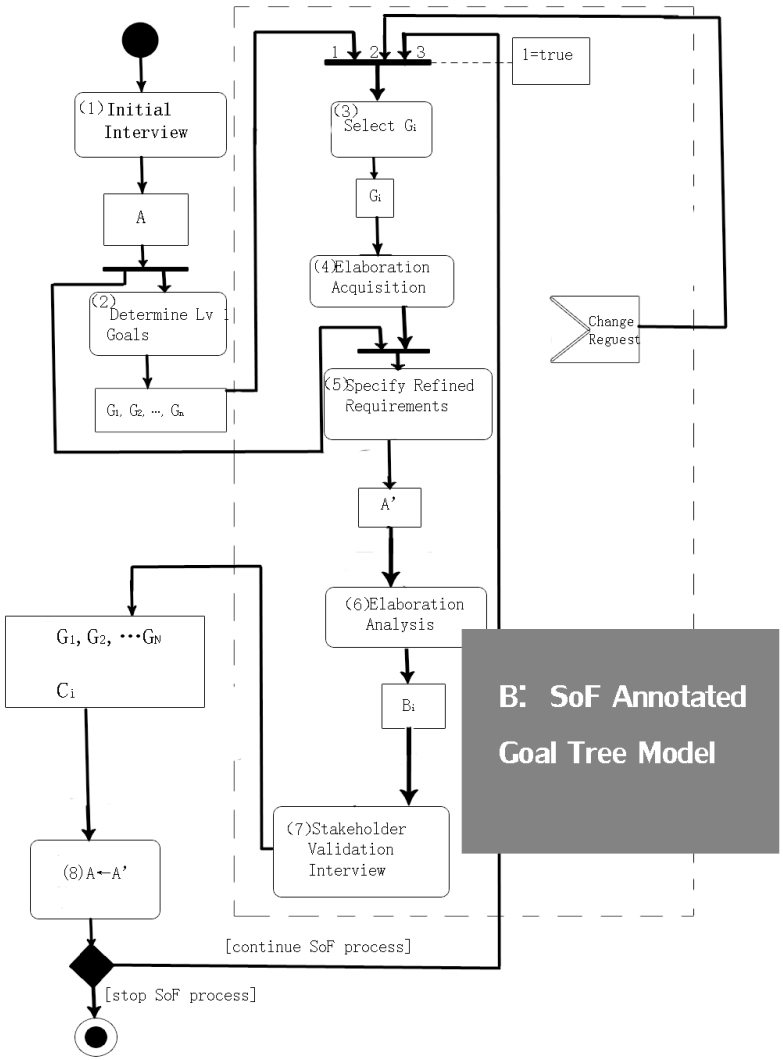

Figure : Activity Diagram of SoF Process

Outline

Why is a Scenario Description Needed?

- A summary of stakeholder interview. It records stakeholders' expectations of the future system.
- A readable document for stakeholders. Scenarios are used to organize complex requirements.
- A basis of subsequent goal refinement and goal validation.

How to Build a Scenario Description?

- Design goal acquition interview and prepare scenario-based questions.
- Documentation of knowledge acquired from stakeholders.
- Unlimited ways to write a scenario description.
  1. Formal or Informal
  2. In Nature Language or Algebraic Language.
  3. Flat text or specific data structure.

Example of a Possible Implementation of Scenario Description

SceneName: ProjectManagement

Concerns: Manager of Technology Department as A0, Project Manager as A1.

SceneDescription:

(Event 1) → EventName: Creating a new Project.

→ TriggerEvent: The company wins a bid.

→ Action: (1) A0 fills in the properties of the project.

(2) A0 confirms to save the new project data.

(Event 2) → EventName: Selecting Development Team.

→ TriggerEvent: Event 1

→ Action: (1) Before making a choice, A0 sholud look through information of developers to make sure that they are properly-qualified.

(2) A0 selects project manager and developers from a list provided by the future system, which creates a new team.

(3) A0 confirms to save the data of a team responsible for a project.

(Event 3) → EventName: Editting Project State

→ TriggerEvent: A periodic timeout event

→ Action: (1) A1 Edits the progress and other information of his current project.

(2) A1 Confirms to save the new state of project.

(Event 4) → EventName: Querying Project State

→ TriggerEvent: A0 wants to know about current progress of a certain project.

→ Action: (1) A0 selects a project.

(2) A0 looks over the project state information presented by the future system.

Example of a Possible Implementation of Scenario Description

1. In this example, stakeholders describe the scenario: "how a technical manager manage projects."
2. This scenario includes four events:
   1. *create a project*
   2. *select development team*
   3. *edit project info*
   4. *and query project progress*
3. Informal but Informative
   1. It used in goal validation interviews because its readability.
   2. Goal elaboration should not directly use this informal description, but the information provided by it helps the reasoning of *SoF Annotated Goal Tree Model*.

Outline

Design of Annotated Goal Tree Model

1. Modeling:
   1. KAOS Goal Model (top-down decomposed)
   2. RWS Annotation (for stakeholder validation)
2. A goal reasoning tool:
   1. Goal Refinement Reasoning
   2. Goal Confict Management
   3. Requirements Evaluation
3. A documentation of goals
4. A communication material in validation interviews

2 types of Goal Elaboration Results

1. Pass: a basis of the next *SoF Elaboration Activity*
2. Failure: a driven model for communication with stakeholders and control of requirements changes.
3. Goal validation phase of *SoF Elaboration Activity* can be further decomposed according to the design of annotations of *SoF Annotated Goal Tree Model*.
    1. relevance validation
    2. success validation

SoF Annotated Goal Tree Model adds the following two types of marks:

- The mark "relevance" is used to record whether a goal has passed relevance validation.
- The mark "agreed" is used to record whether a relevant goal has passed success validation.

Goal Elaboration

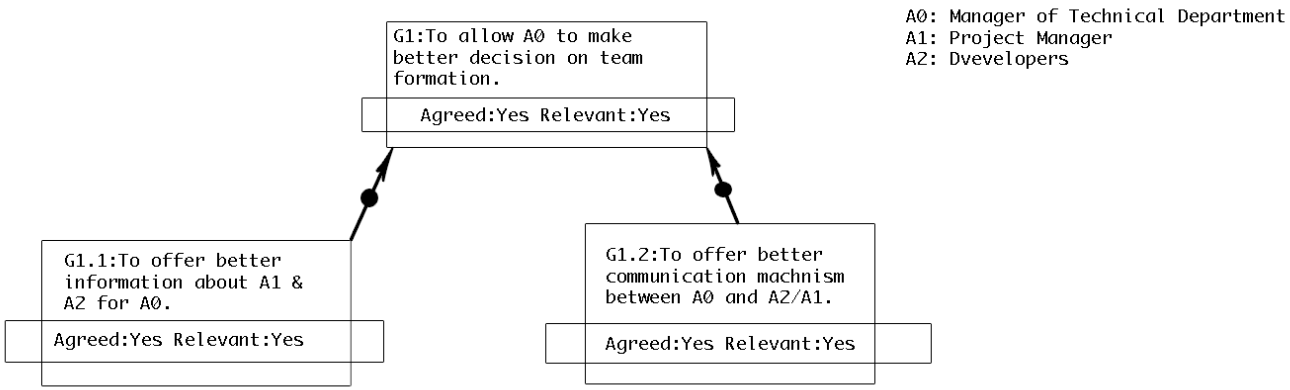

Figure : SoF Annotated Goal Tree(Validated,Level 1 Elaboration)

Further Elaboration

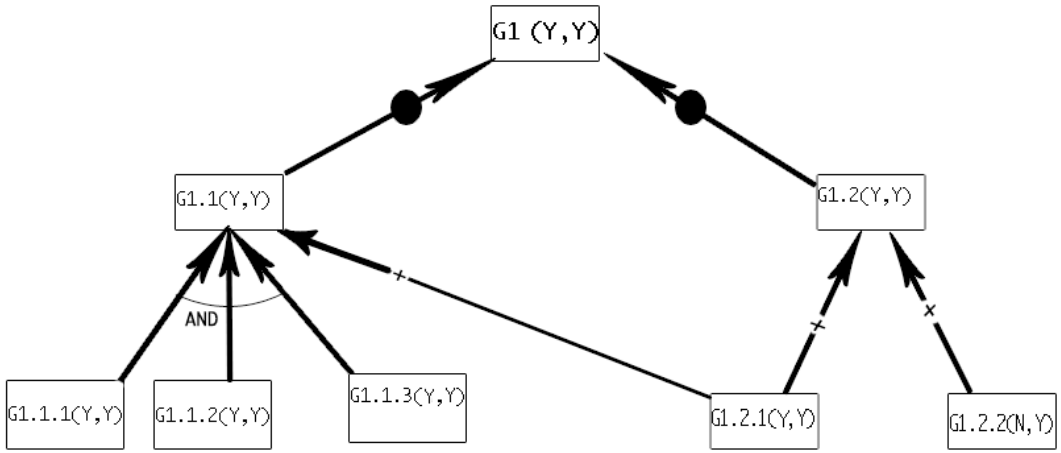

Figure : SoF Annotated Goal Tree(Validated,Level 2 Elaboration)

Further Elaboration

- Here lists the detailed description of each goal that is not mentioned above.
  1. $G_{1.1.1}$ is "Project managers input information of developers".
  2. $G_{1.1.2}$ is "To access information of developers".
  3. $G_{1.1.3}$ is "Project managers should update information of developers periodically".
  4. $G_{1.1.1}$ $G_{1.1.2}$ $G_{1.1.3}$ work together to support their parent goal.

  If any of them fails to pass the evaluation, the whole elaboration plan fails.

Further Elaboration

1. $G_{1.2.1}$ is "To provide an instant messaging platform for technical department managers, project managers and developers".
2. $G_{1.2.2}$ is "To publish decisions made by technical department managers and allow developers and project managers to reply asynchronously".
3. $G_{1.2.1}$ does not conflict any other goal, and facilitates $G_{1.1}$ because the establishment of communication platform contributes positively to technical department managers' knowledge of developers' information. Thus $G_{1.2.1}$ passed both validations.
4. $G_{1.2.2}$, although had passed the relevance validation, however, failed to pass the success validation because stakeholders believe that asynchronous communication is not practical and efficient enough to ensure the timeliness and richness of feedbacks.

Summary

- Against requirements nondeterminism.
- Ensuring the quality of each step of elaboration.
- Consistency between goal models and stakeholders' conceptual models.

- Outlook
  - Difficulty in validating the effectiveness of my proposal.
  - Cost Problem.
    1. considerably frequent communication between and among requirements developers and stakeholders
    2. collection and management of raw data from stakeholders
    3. ubiquitous involvement of stakeholders