**V. Goal Diagrams**

**Goals and AND/OR Trees**

**Building Goal Diagrams**

**How and Why Questions**

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**Goals**

- Goals represent business objectives for the new system and its operating environment.

- For example:
  - "Fulfill every book request" (Library organization)
  - "Produce 1M MacG5s within a year" (Apple), or,
  - "Serve more passengers" (TTC)

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**Softgoals**

- These are goals that are used as criteria for comparing alternative solutions for other goals.

  - E.g., Higher profits\[ProductionUnit3\],
  - Better service, Satisfied customer,
  - User-friendly\[Interface2\],
  - Portable\[Module4\]

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**Alternatives for Satisfying Goals**

- An AND-goal is satisfied if all of its subgoals are; an OR-goal is satisfied if at least one its subgoals is.

- An alternative (solution) to a root goal G consists of a set of leaf goals which together satisfy G.

- There are 24 alternatives for the goal of the previous slide.

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**Usability**

- Ease of Access
- Information Sharing
- Ease of Learning
- User Flexibility
- Portability
- Modularity
- User-defined Writing Tool
- User-defined Components
- User-defined Modeling Tool
Goal Relationships

- We will use more than AND- and OR-relationships:
  - ✓ + -- one goal contributes positively towards the fulfillment of another goal;
  - ✓ - -- one goal contributes negatively towards the fulfillment of another goal;
  - ✓ ++ (--) -- one goal subsumes/negates another, i.e., if the first goal is fulfilled, the second is fulfilled/denied;
- With these enhancements, we can build goal models which could be useful for strategic business analysis or requirements analysis.

Alternatives for Satisfying Goals

- An alternative (solution) to the fulfillment of a goal \( G \) consists of one or more leaf goals which together fulfill the root goal.
- A goal model defines a space of alternatives for the fulfillment of its root goal.
- An alternative \( A_1 \) is better than \( A_2 \) in fulfilling goal \( G \) with respect to softgoals \( G_1, G_2, \ldots \) if \( A_1 \)'s net contributions to \( G_1, G_2, \ldots \) (e.g., positive minus negative contributions) is greater than that of \( A_2 \).
- In general, goals and softgoals can be contradictory. Given a set of root goals and softgoals, there may not be an optimal solution [Simon68]. Hence the search for good-enough solutions.

Building Goal Diagrams

- Start from one or more goals and/or softgoals \( G_1, G_2, \ldots, G_n \) which need to be fulfilled together.
- Analyze each, looking for ways to fulfill it through AND- or OR-decompositions, or through other refinements which contribute positively (How questions).
- Continue this process until there is enough positive support to fulfill all root nodes. At this point you have \( n \) disconnected goal trees \( T(G_1), T(G_2), \ldots, T(G_n) \).
- Identify positive or negative inter-tree influences, i.e., positive or negative relationships between goals \( g, g' \) which belong to different goal trees.
- Repeat the analysis to see if root goals are fulfilled; if so, done, else continue the analysis.

Softgoals as Criteria

- Quality of schedule
- Degree of participation
- Collection effort
- By person
- Automatically

Library Goals

- Satisfy every book request
- As many copies as needed
- Enough copies
- Availability notified
- Regular availability
- Limited loan period
Public Transit Goals

Serve more passengers
Minimize costs
Min operating costs
Min develop costs
Min time between stations

Why Questions

Why do we need smooth movement?

Min operating costs
Passenger comfort

Min power usage
Min equipment stress
Min smooth movement

Passenger comfort