Expert Systems in the Insurance Industry

Uses of Expert Systems in Insurance
- Underwriting
- Policy Matching
- Benefit Querying
- Claim Processing

Bening
A Benefit Inquiry tool
BenInq

- helps customer service representatives determine what medical services a customer is covered for

Why?

- Insurance companies have many products
- Better searching
- More detailed information
- Easier to modify

How It Works

- Knowledge representation
- Rule Representation
- Reasoning Methods
Knowledge Representation

- Services
- Benefits
- Coverage
  - Business Rules
    - Cost sharing
    - Access
    - Administrative and Medical

External Representation

- Both Services and Benefits are organized in semantic networks
- Services are organized in a multiple-inheritance hierarchy
- Benefits are shown by using 'covered' and 'excluded' links between benefits and services nodes

Internal Representation

- Represented as a Formula-Augmented Semantic Network (FAN)
- A FAN allows us to attach rules to nodes using well-formed formulae
- These rules allow us to apply regulations to each of the nodes
**Internal Representation**

![Diagram of Internal Representation](image)

**Rule Representation**

- Rules are represented using well-formed formulae

  \[
  \text{Drug-rehab}(p) \land \text{enrolled}(x,p) \land \exists j \text{ sub}(j) \land \text{non-compliant}(x,p,j) \rightarrow (\text{Drug-rehab}(p2) \land \text{enrolled}(x,p2) \land \text{time}(\text{start}(2)) - \text{time}(\text{end}(j)) \leq 1\text{year}) \rightarrow \neg \text{covered}(x,p2))
  \]

- translates to: Patients in Drug Rehabilitation programs lose all rehab benefits for one year if they are non-compliant

**Reasoning Methods**

- Determining if a service is covered or excluded by a benefit
- Determining which rules apply to a node
Reasoning Methods

- Well-Formed Formula
  - Inheritance problem
    - Since nodes can inherit from multiple parents which rules apply?
- Maximally Consistent Subsets (mcs)
- Preferred Maximally Consistent Subsets (pmcs)

PMCS

- First remove conflicted and pre-empted edges
- Then, starting at the focus node traverse upwards
- At each node take the pmcs of the set computed so far and the wff's at the current node
Implementation

- System comprises of two tools
  - inquiry tool
  - authoring tool
- Implemented using VisualAge Smalltalk

Usage

- Two main user groups
  - Customer Service Representatives (CSR’s)
  - Policy Modifiers (PM’s)

CSR’s View

- Shows services, coverage information, and rules
**PM's View**

- Can add new benefits, modify services and benefits, or delete products

**Evaluation**

- Users found the system very user friendly and required little to no training
- PM's however did have one issue: modifying or adding wff's was difficult

**Colossus**
**What is Colossus?**
- Used in claims processing
- Injuries are classified according to 600 injury codes
- Using this information it provides an amount to cover the damages the person suffered

**Why?**
- A GIO study found that there was a standard deviation of 80% for the same claim by different assessors

**How it works**
- Assessors are asked up to 700 questions (usually less)
- The system compiles the information from the questions into 5 categories
- The system combines the 5 categories into a percentage value
**Issues**

- There are 3 variables which affect how Colossus reaches its recommended figure
  - Interpretations of the facts by assessors
  - How Colossus uses the data to construct the 5 categories
  - The algorithm to combine the categories into a percentage

**Results**

- After implementing the system GIO found that the standard deviation for claims dropped from 85% to 15%

**Use**

- Originally used by GIO of Australia
- Colossus also is used by 13 of the top 20 US Property and Casualty insurers
Bibliography

