Developing Knowledgebase for Educational Diagnostics

Dr. Renu Bagoria[1] Miss Parul[2]
[1,2]Jagannath university, Chaksu, Jaipur

Abstract— An expert system is software that acts like a human expert on a particular subject area. Expert systems are often used to advice people in situations where a human expert is unavailable. When some child in school is showing some unusual difficulty in learning, remembering, or using material that is taught, the child's teachers may feel it is necessary to undertake an educational diagnosis. Educational diagnosis is the detection of such unusual behavior like learning difficulty, the determination of the nature and its remediation. It is a complex task that should be taken care by qualified personnel using defined methodologies, in some circumstances, the task can be made easier if the diagnostician is guided and assisted by a computer. This paper presents some of the aspect of educational diagnostics with some representation of certain rules and knowledge in this area.

Key words: Educational diagnosis, Knowledge Representation

I. INTRODUCTION

When a child in school is having unusual difficulty in learning, remembering, or using material that is taught, the child's teachers may feel it is necessary to undertake an educational diagnosis. Educational diagnosis is the detection of learning difficulty, the determination of the nature and its remediation. It can be a complex task that should be performed by qualified personnel using accurate materials; in some circumstances, the task can be made easier if the diagnostician is guided and assisted by a computer.

Educational diagnosis can be carried out by several different kinds of people, depending upon the severity of the case at hand and the diagnostician's familiarity with the problem. At the simplest level, diagnosis can be performed by the child's regular classroom teacher. Certain kinds of diagnosis are within the qualifications of this type of teacher, who may possible have no background in special education. Indeed, the regular classroom teacher has the advantage that he or she knows the child well and is familiar with the child's work. If problems are more severe, the child may be referred to a resource room teacher. Such a teacher has a background in special education and can carry out more complex diagnoses and recommend special remediative programs. The last level of diagnostician is the education psychologist, who has the most comprehensive training and has the deepest knowledge of remediative methods.

The practice of educational diagnostic can be classified in different ways.

1) Diagnosis by child's regular classroom teacher.
2) Identification of problem area.
3) It possible logical explanation for the problem.

The degree of problem is measured directly by the feedback of classroom teacher and does not really involve any inference beyond test selection. An approximate problem area can usually be inferred from the test result and this is true primary component of the diagnostic task.

Information is often not sufficient for accurate explanation's to be formed although where possible, they are a part of the final diagnosis. This system focuses on problem of classification and did not address the question of solution.

1. Developmental
   - Sensory (vision, hearing)
   - Psychological
   - Social
   - Adaptive skills

2. Mental Health
   - Medical Pre content natal, Peri-natal, Post natal difficulties
   - Trauma History
     - Accident, injury or illness
     - Divorce or death
     - Faster care or adoption
     - Natural disaster
   - Behavioral changes
     - Interpersonal difficulties
     - School readiness/Academic Concern

3. Educational
   - Logical Reasoning
   - Math's Problem
   - Reading/Writing

List of Diagnostic Categories

II. KNOWLEDGE REPRESENTATION

All the information which was collected in the knowledge acquisition phase is translated into the system's representation. This corseted of .

1) Identifying and representing concepts mentioned by the expert.
2) Assembling some of the concepts into example structure.
3) Identifying and representing relationship between concepts mentioned by the expert.

A. Constructing Example Structures

1) Category: Development Problem

Features:

- Development (delay)
- speech (delay)
- Intellectual (disorders)

// mental retardation

- Reading (no)
- Pre-natal-difficulties (yes)
- Illness (yes)
- Parent - Alcohol (yes)
- Natural - disaster (yes)

2) Category: Behavioral-Mental Health

- Hyperactivity (yes)
- Attention deficit (yes)
- Conduct-disorder(yes)
- Mood-disorder (yes)
- Depression (yes)
- Anxiety-disorder (yes)
- Accident - injury (yes)
- Illness (yes)
- Parent-divorce (yes)
- Faster-care (yes)
- Natural - disaster (yes)

3) Category: Medical

- Behavior (abnormal)
- Genetic-disorders (yes)
- Illness (yes)
- Accident (yes)
- Pre-natal difficulties (yes)
- Peri - natal-difficulties (yes)
- Post - natal - difficulties (yes)

B. Structuring Concepts into a Network and Relationship

Capturing the background knowledge associated with a care, required representing as many as possible of the relationship described in the interview.

1) The Relation Language

1. Current to successor state, temporal relationships causes, is caused by

DevelopmentProblem
↓ causes by
Development (delay)

2. Structured to function mapping: has function is function of

DevelopmentProblem
↓ has function
Intellectual (disorder)

3. Set inclusion relationship

Illness (yes)
↓ Generalization
Medical

4. Part of whole relationship

DevelopmentProblem
↓ has part
speech (delay)

5. Logical inference relationships : implies, if only if

Not Well
↓ implies
Illness (yes)

6. Features to categories relationships

Intellectual (Problem)
↓ sufficient for
Development Problem

In order to provide a finer - grained link description language and to permit representing quantitative estimates, the following qualifiers were used for relationships. Qualifiers captured additional knowledge by clarifying the source and degree of uncertainly in inferences using the relation.

1) Qualifiers describing estimates of frequency: always, usually, sometimes, occasionally, regally.
2) Qualifiers describing strength of relationship: strongly moderately, weakly, very weakly.
3) Qualifiers describing certainly that the relationship exists: certainly, probably, possibly, conceivably.
4) Qualifiers describing temporal characteristics: instantly, quickly, gradually.

2) Relationships Derived For Three Cases

Development (delay)
↓ causes
DevelopmentProblems

Speech (delay)
↓ sometimes couses
DevelopmentProblems

Intellectual (disorder)
↓ causes
DevelopmentProblem

Reading (No)
↓ rarely causes
DevelopmentProblem

Pre-natal-difficulties(yes)
↓ might cause
Development(delay)

Illness (yes)
↓ might
Development(delay)

Parent-alcohol (yes)
↓ might cause
DevelopmentProblem

Hyper-active
↓ causes
Behavioralmental Health

Conduct-disorder
↓ Sometimes causes
Behavioralmental Health

Mood-disorder
↓ some times
Behavioralmental Health

Depression
↓ always
Behavioralmental Health

Anxiety - disorder
↓ always
Behavioralmental Health

Accidental-injury (yes)
↓ might cause
Behavioralmental Health

Illness (yes)
↓ might cause
Behavioralmental Health

Parent-divorce (yes)
↓ might cause
Behavioralmental Health

Foster-care (yes)
↓ sometimes causes
Behavioral mental Health

Behavior (abnormal)
↓ sometimes causes
MedicalProblem

Genetic - Disorder (yes)
↓ Might causes
MedicalProblem

Illness (yes)
↓ Always causes
Medical Problem

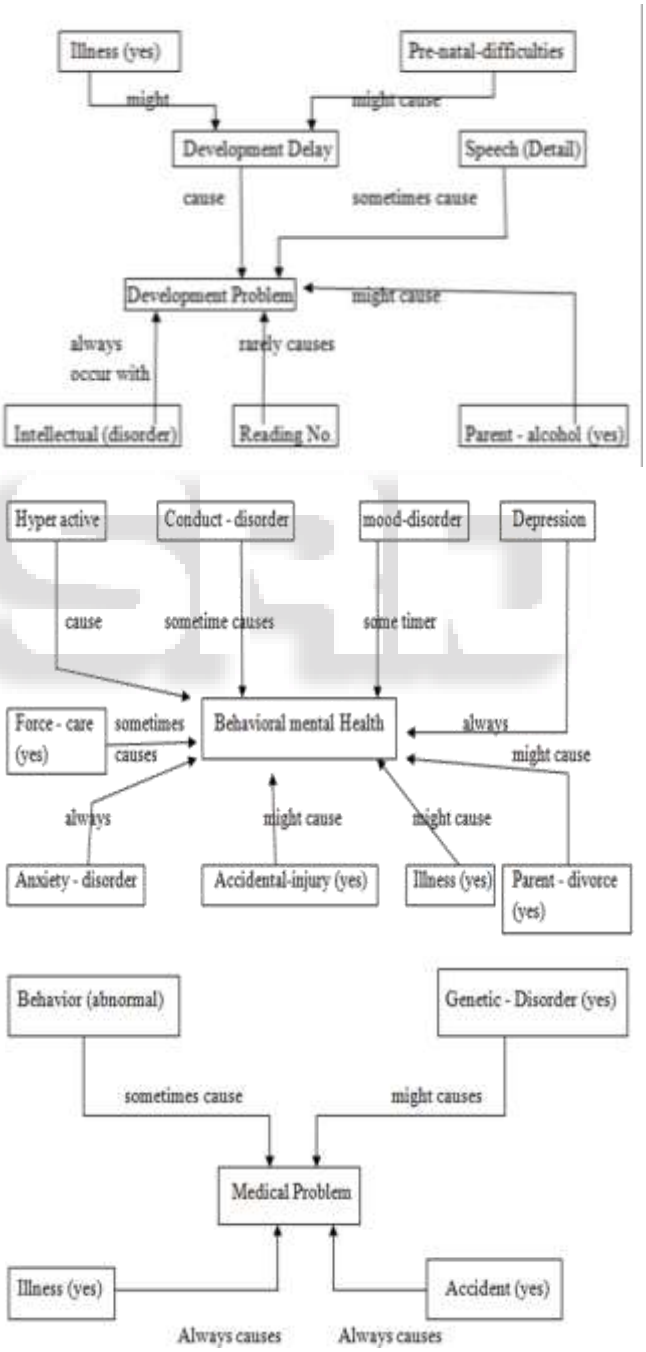
Accident (yes)
↓ Always causes
Medical Problem

C. Representational Assumptions and Simplifications

Some of the representational assumptions and simplifications made in this implementation were:

1) All concepts can be assertions about child from the perspective of mental health of a child.
2) A relatively small set of general relations is sufficient to compute inference strengths between related concepts.
3) Only positive relationships need to be expressed to achieve adequate performance. Concepts are assumed to be absent unless there is positive evidence for their existence.

D. Explanations



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