IMPLEMENTATION OF AUTOMATA THEORY TO IMPROVE LEARNING ABILITY FOR LEARNERS

K. Azarudeen
Assistant Professor, Department of Computer Science and Engineering
Velammal College of Engineering and Technology, Madurai

B. Indhu, N. Pyntamil, M. Sathya & C. Krithiga
Department of Computer Science and Engineering
Velammal College of Engineering and Technology, Madurai

Abstract
A learning disability is a neurological disorder. In simple terms a learning disability results from a difference in the way a person's brain is wired. Children with learning disabilities are as smart or smarter than their peers. Learning Disability (LD) is totally different from general disability. There are various types of disability progressing in the world like blindness, deafness and physical disabilities. It is difficult to deal with people disability. Dealing children with learning disability is difficult for both parents and teachers. By using Theory of Automata it is easy to analyse the level of disability among all students, then deal with them accordingly. For these purpose deterministic automata is the best practice. In this research Deterministic Automata is the practice. In this research Deterministic automata is used to facilitate the teacher in identification of students with learning disability. A suitable automata is developed for dealing with disorders like Dysgraphia, Dyscalculia, Dyslexia, Dyspraxia e.t.c. Using this automata, teacher as well as parents could come to know about the disorders faced by the children.
Keywords*: Learning Disability, Dysgraphia, Dyscalculia, Dyslexia, Dyspraxia.*

Introduction

Learning disability is a problem that affects how a person receives and process information. People with Learning Disability have trouble with any of the following: Reading, Writing, doing math, understanding directions, handling money, poor vocabulary, short attention span, poor concentration, delayed speech. Various separate tests such as Gibson test, IQ test, forward test, Gamified technique, are present to identify the disorders. These tests were not efficient and they provide a very limited picture of intelligence and the time consumption is also high. Dysgraphia often occurs in children at age 6-9. It denotes writing difficulty along with inaccurate copying of letters and words, less vocabulary skills. Dysgraphia co-occurs with Developmental language Disorder. Dyslexia occurs in children at age 5-6. It shows difficulty in grammar, reading, understanding words. It co-occurs with Attention Deficit Disorder and Dyscalculia. Dyscalculia refers to difficulty in math along with less memorization, organization of numbers and signs as well as handling money.

Literature Survey

Learning disability is a multidisciplinary concept used in the field of science education, psychology and medical science that is often used by many parties to explain children who are unable to meet normal demands or cannot achieve normal standards in school in general ways that

other children can meet. In *"Implementation of Automata Theory to Improve the Learning Disability"* paper it provides idea that learning disability can be implemented using automata. The suggested automata model helps children with learning disability to overcome their deficiency in particular domain (science, mathematics etc). In *"An expert system for Diagnosing "Dysgraphia"* it uses IQ test and forward chaining methodologies used to identify dysgraphia and the level of dysgraphia can be known. It performs knowledge acquisition through interviews and observations. The knowledge gained were analyzed and the results was represented in the form of decision tree. The IQ tests still provide a very limited picture of intelligence. In *"Diagnosis of Dyslexia using computational analysis"* it introduces diagnosis of dyslexia using computing system. The Gibson test is used to identify dyslexia. It measures primary learning skills along with memory, logic and reasoning in students. A computational model is designed to help counselors and parents understand the difficulty and get kid in the correct passageway to education success. Here the teacher needs to be constantly evaluating needs of the student and designing the learning activities and so the time consumption is high.

Proposed System

The disorders in learning are Dysgraphia, Dyscalculia, Dyslexia, Language processing disorder, Auditory processing disorder, Non-verbal learning disabilities, Visual motor deficit, ADHD, Dyspraxia etc. Among these we consider the disorders Dyscalculia, Dyslexia. The processing deficit is one of the main problem of these disorders. People facing Dyscalculia also suffer from visual stress and poor concentration. It is also due to processing deficit but they are slow in their work in addition. People facing Dyslexia commonly have visual and memory impairment along with ADD (attention deficit disorder). An automata has been developed for these disorders. This automata generated can be simulated using software such JFLAP (Java Formal Languages and Automata Package), FSM (finite state machine) simulator, Automaton simulator, GOTCHA/ TC Beacns, FSM library, Automatic Test Generation from formal specification. Among these the commonly used tools are JFLAP and FSM simulator.

Working Description

A finite-state machine (FSM) finite automaton, or simply a state machine, is a mathematical model of computation that can be implemented with hardware or software and can be used to simulate sequential logic and some computer programs. Finite state automata generate regular languages. It is an abstract machine that can be in exactly one of a finite number of states at any given time. The FSM can change from one state to another in response to some external inputs. This change is known as transition. An FSM is defined by a list of its states, its initial state, and the conditions for each transition. Finite state machines can be subdivided into transducers, acceptors, classifiers and sequencers.

Acceptors (also called recognizers and sequence detectors), produce binary output, indicating whether or not the received input is accepted. Each state of an FSM is either "accepting" or "not accepting". Once all input has been received, if the current state is an accepting state, the input is accepted; otherwise it is rejected. A classifier produces a single output on termination but has more

than two terminal states. Transducers generate output based on a given input and/or a state using actions. Simulation in FSM simulator can be done using the following steps:

A. Create Automaton

Initially an automaton is created to display the FSM's transition graph. A valid FSM definition contains a list of states, symbols and transitions, the initial state and the accepting states. States and symbols are alphanumeric character strings and can not overlap. Transitions have the format:

State A: symbol>State B, State C. The ***$*** character is used to represent the empty string symbol (epsilon) but should not be listed in the alphabet.

#states
student
visual stress
poor concentration
age 5-6
age 7-9
counting problem
less memory
word problem
handling money
dyscalculia
#initial
student
#accepting
dyscalculia
#alphabet
a,b,c,d,e,f,g,h,i
#transitions
student:a>visual stress
visual stress:b>poor concentration poorconcentration:c>56 poorconcentration:d>79
age 5-6:e>counting problem age 5-6:f>less memory age 7-9:g>word problem age 7-9:h>handle money counting problem:i>dyscalculia mem:i>dyscalculia
prblm:i>dyscalculia
mon:i>dyscalculia

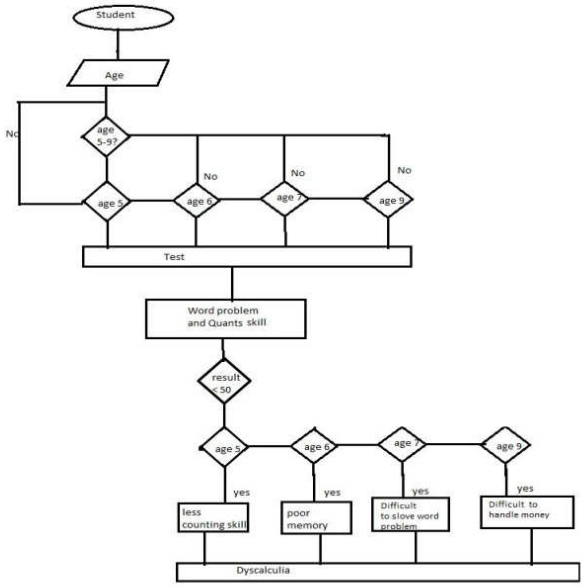
B. Simulate Automaton

Enter a sequence of input symbols into the input field below or click *Random string, Acceptable string and Unacceptable string* to have the app generate random acceptable and unacceptable sequences. The input field highlights the input symbol that will be read next.

C. Transition Graph

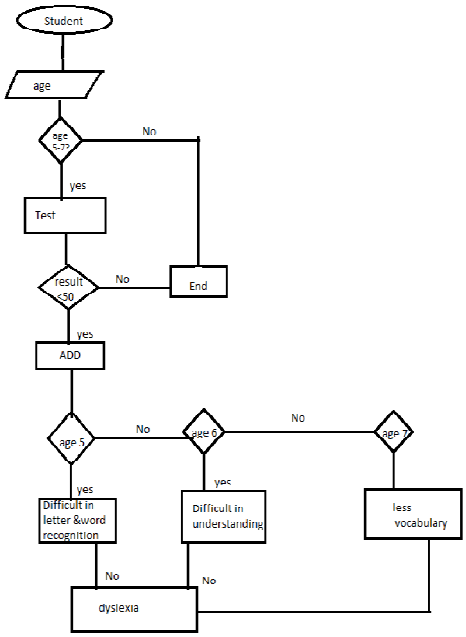
The FSM being simulated is displayed in the form of a transition graph. The nodes representing the current states of the FSM are colored.

Computational Model for Dyscalculia



Dyscalculia occurs at age 5-9.The hyperactive student attends certain tests such as solving word problems and quantitative aptitudes. Based on the results (less than 50%) the students at the age 5 show less counting skills and students at age 6 show poor memory power. Similarly the students at age 7 show difficulty in solving word problem and age 8 students have difficulty in handling money.

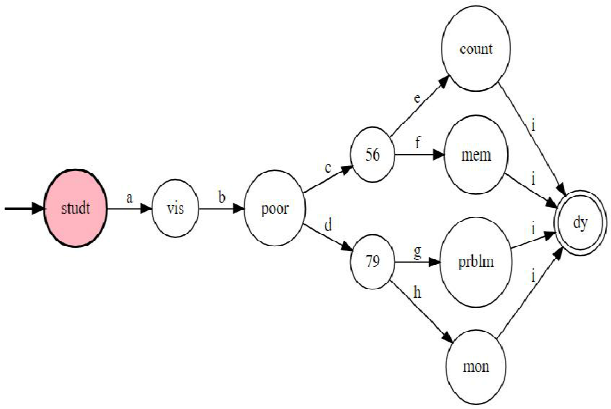
Computational model for dyslexia



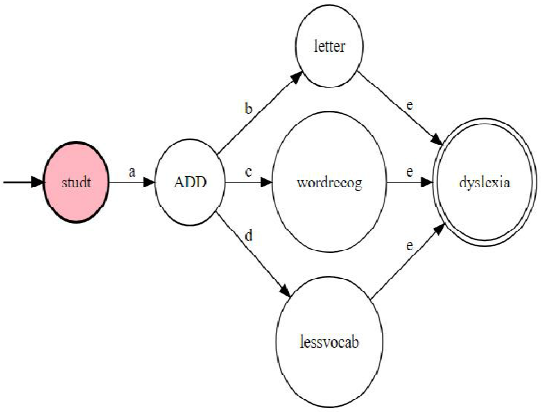
Dyslexia commonly occurs at age 5-7. The inattentive student attends certain tests such as verbal and vocabulary skills. Based on the results and their ages children at age 5 have difficulty in word recognition and children at age 6 have difficulty in understanding and children at age 7 have less vocabulary skills.

Proposed Model

Dyscalculia



Dyslexia



Benefits of Proposed System

Accurately identify students disorder Efficiency is high Time consumption is low.

Conclusion

Theory of Automata is a best practice to identify children with learning disabilities. Using Automata concept one can easily classify the type of learning disability too. The above proposed automata accurately identify students disorder. The suggested automata model can be used by the teacher, parents and education facilitator .This model can be an applied at any level of education.

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