

Case-Based Reasoning Approach for Thalassaemia Diagnosis

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TABLE OF CONTENTS

	PAGE
PERMISSION TO USE	i
ABSTRAK	ii
ABSTRACT	iii
ACKNOWLEDGEMENT	iv
LIST OF TABLES	v
LIST OF FIGURES	vi
LIST OF ABBREVIATIONS	vii
CHAPTER 1 : INTRODUCTION	
1.1 Problem Statement	05
1.2 Objectives	08
1.3 Research Scope	08
1.4 Research Method	10
1.5 Research Contribution	11
1.6 Organization of the Thesis	11
CHAPTER 2 : Artificial Intelligence (AI) Techniques in Medical Diagnosis	
2.1 Introduction	12
2.2 Rule-based Reasoning	12
2.2.1 The Limitation of Rule-Based Reasoning	13
2.3 Back-Propagation Neural Network	14
2.3.1 The Limitation of Back-Propagation Neural Network	15
2.4 Case-based Reasoning	16
2.5 The Advantages of CBR over the Two Approaches	20
a. Reduces Knowledge Acquisition Bottleneck	
b. Easier Maintenance and Learning Process	
c. Faster Reasoning and Development Process	
d. Better Justification Facility	

CHAPTER 3 : THE DESIGN OF THALASSAEMIA DIAGNOSIS PROTOTYPE (TDS)

3.1	Introduction	24
3.2	Case base Preparation	25
3.2.1	Feature Selection	26
3.2.2	Case Representation	27
3.2.3	Case Organization	28
3.3	Case Retrieval	30
3.4.1	Configure Similarity Assessment Function	32
	a. Local Similarity	
	b. Global Similarity	
3.4.2	Traverse Case Base to Find k -NN	35
3.4.3	Diagnosis based on the Similarity Value of k -NN	37
3.5	Working Example using k -Nearest Neighbour	37
3.5.1	Ratio Local Similarity and Weighted Block-City Global Similarity (RWBC)	38
3.5.2	Euclidean Local Similarity and Weighted Block-City Global Similarity (EWBC)	40
3.5.3	Euclidean Local and Global Similarity (EE)	41
3.5.4	Ratio Local Similarity and Euclidean Global Similarity (RE)	42
3.6	Evaluation of TDS Diagnosis Accuracy	44

CHAPTER 4 : TESTING AND RESULTS

4.1	Detemining Parameters for TDS	46
4.1.1	Selection of k Value of Nearest Neighbour	46
	a. RWBC	
	b. EWBC	
	c. EE	
	d. RE	
4.1.2	Selection of Local and Global Similarity Value with Fixed Nearest Neighbour	54
4.2	Performance of TDS	56

CHAPTER 5 : CONCLUSION AND RECOMMENDATIONS

5.1	Limitations	59
5.2	Recommendations	60

REFERENCES

APPENDIX A	Blood Test Form
APPENDIX B	TDS Parameter Determination Testing Detail
APPENDIX C	TDS Performance Testing Detail

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ABSTRAK

Thesis ini mencadangkan sebuah model penaakulan berasakan kes untuk diagnosis Thalassaemia. Model ini direkabentuk dan sebuah prototaip (TDS) dibina bagi menguji ketepatan diagnosis model tersebut. Dua method persamaan lokal digabungkan dengan dua persamaan global dan diuji untuk mendapatkan mengenalpasti model yang sesuai. Nilai K yang berpatutan juga dikenalpasti untuk model ini. Akhirnya, pengujian menggunakan teknik '*leave-one-out*' dilakukan ke atas kes-kes sebenar daipada Hospital Besar Alor Star dan hasil ujian ketepatan diagnosisnya mencapai 88%. Hasil ujian ini menunjukkan bahawa teknik penaakulan berasaskan kes berpotensi untuk digunakan dalam diagnosis penyakit Thalassaemia.

ABSTRACT

This thesis proposes a Case-based Reasoning model for medical diagnosis, particularly for Thalassaemia diagnosis. The model is designed and a prototype is developed to test the diagnosis accuracy of the model. Two local similarity combined with two global similarity is evaluated to identify the suitable similarity function for the model. The appropriate K value for Nearest Neighbour also identified for this model. Finally, the testing done using leave one out method on Thalassaemia cases from Alor Star General Hospital and the testing demonstrates 88% of diagnosis accuracy. The results show that case-based reasoning model has a great potential to be implemented in diagnosing Thalassaemia cases.

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List of Tables

Table	Title
3.1	Ten features to Diagnosis Thalassaemia
3.2	Sample case in the Thalassaemia Case-Base
3.3	New case to be diagnosed
3.4	Sample case retrieved using RWBC algorithm
3.5	Sample case retrieved using EWBC algorithm
3.6	Sample case retrieved using EE algorithm
3.7	Sample case retrieved using RE algorithm
3.8	New Case and the five (5) Nearest Neighbours using RE algorithm
4.1	Diagnosis Accuracy using RWBC by k - Nearest Neighbour Values
4.2	Diagnosis Accuracy using EWBC by k - Nearest Neighbour Values
4.3	Diagnosis Accuracy using EE by k - Nearest Neighbour Values
4.4	Diagnosis Accuracy using RE by k - Nearest Neighbour Values
4.5	Diagnosis Accuracy with fixed Nearest Neighbour Values
4.6	Diagnosis Accuracy using Test Set

List of Figures

Figure	Title
1.1	Thalassaemia Inheritance Process
1.2	The Scope of the Research
3.1	The process flow of TDS
3.2	Form-like Flat Case-base
3.3	Structure of Cases
3.4	The cases compared in two levels
3.5	Retrieval using k -NN where $k=3$
4.1	Diagnosis Accuracy using Ratio Local Smilarity and Weighted Block-City Global Similarity by K Nearest Neighbour Value
4.2	Diagnosis Accuracy using Ratio Local Smilarity and Weighted Block-City Global Similarity by K Nearest Neighbour Value
4.3	Diagnosis Accuracy using Euclidean Local Similarity and Global Similarity by K Nearesest Neighbour Value
4.4	Diagnosis Accuracy using Ratio Local Similarity and Euclidean Global Similarity by K Nearesest Neighbour Value
4.5	Comparison of Diagnosis accuracy using all 4 techniques

List of Abbreviations

AI	Artificial Intelligence
CBR	Case-Based Reasoning
TAM	Thalassaemia Association of Malaysia
FBP	Full Blood Picture
HB	Hemoglobin
BP	Back-Propagation Neural Network
TDS	Thalassaemia Diagnosis Support
TRBC	Total Red Blood Count
MCV	Mean Corpuscular Volume of red Cells
MCH	Mean Corpuscular Haemoglobin
MCHC	Mean Corpuscular Haemoglobin Concentration
ALDEHBF	Alkaline Denaturation for Haemoglobin Feotus
HBEL	Haemoglobin Electrophoresis
HBA2S	Haemoglobin A2 Estimation
HINC	Heamoglobin Inclusion
k-NN	k Nearest Neighbour
SEFE	Serum Ferritin
RWBC	Ratio Local Similarity and Weighted Block-City Global Similarity
EWBC	Euclidean Local Similarity and Weighted Block-City Global Similarity
EE	Euclidean Local and Global Similarity
RE	Ratio Local Similarity and Euclidean Global Similarity

CHAPTER 1

INTRODUCTION

Case-based reasoning (CBR) is an Artificial Intelligence (AI) technique for high-level reasoning and a knowledge-based paradigm that emerges from the desire to imitate human reasoning in decision making. CBR is known as a subset of Knowledge-based system (Turban, 1995), relies on past similar cases to identify problem solutions. Instead of relying solely on general knowledge, CBR utilizes the specific knowledge of previous experiences or cases to solve new problems by remembering previous similar cases (Leake, 1996; Kolodner, 1993; Riesback, and Schank, 1989). Previous cases are frequently reused to solve current problems and resemble human thought processes. The previous similar cases are reviewed and adapted to solve the current problem. CBR also provides explanation by displaying the collection of cases used to derive the solution (Kolodner, 1991). Furthermore, the case-based reasoning technique is also capable of retaining the new experiences that have been solved for future reference (Manickam and Abidi, 1999).

The study of CBR has been motivated by the desire to model human behavior and to develop technologies that enhance the effectiveness of AI systems (Leake, 1996). According to Aamodt and Plaza, case-base reasoning is one of reasoning techniques in AI that enables the reuse of the stored past cases to derive decisions on the current problem (Aamodt and Plaza, 1994). In real life, human think and solve new problems by remembering previous similar situations that occur in the past as a guide to their decision making process. Once the most similar experiences are identified, the

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