

---

---

*Contents*

---

---

# CONTENTS

---

<b>CHAPTER</b>	<b>TITLE</b>	<b>PAGE</b>
<b>No.</b>		<b>No.</b>
<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
1.1	Magnetic Resonance Imaging	2
1.2	Brain tumors	4
1.3	Image processing for MRI analysis	7
1.4	Tumor detection in multiple MRI sequences	13
1.5	Motivation and Objectives	14
1.6	Chapter formulation	14
<b>2</b>	<b>REVIEW OF LITERATURE</b>	<b>16</b>
2.1	Preprocessing	16
2.2	Clustering	18
2.3	Feature extraction	21
2.4	Segmentation	22
<b>3</b>	<b>METHODOLOGY</b>	<b>24</b>
3.1	Preprocessing	26
	3.1.1 Skull removal from brain MRI	27
3.2	Fuzzy clustering technique	27
	3.2.1 Clustrering	27
	3.2.2 Overview of clustering	28
	3.2.3 Clustering analysis	28
	3.2.4 Fuzzy C-Mean Clustering	29

3.3	Feature extraction	30
	3.3.1 Intensity based features	31
	3.3.1.1 Mean	31
	3.3.1.2 Standard Deviation	32
3.4	HSOM Segmentation	32
	3.4.1 HSOM Taxonomy	33
	3.4.1.1 Agglomerative	33
	3.4.1.2 Thematic agglomerative HSOM	34
	3.4.1.3 Agglomerative HSOM based on cluster	34
<b>4</b>	<b>RESULT AND DISCUSSION</b>	<b>36</b>
	4.1 Dataset Used	36
	4.2 Performance metrics used	38
	4.2.1 Execution time	38
	4.2.2 Accuracy	39
	4.3 Experimental results	39
	4.3.1 Preprocessing	39
	4.3.2 Clustering technique	40
	4.3.3 HSOM segmentation	40
	4.3.3.1 Accuracy	41
	4.3.3.2 Elapsed time	42
	4.3.3.3 Tumor size	43
<b>5</b>	<b>SUMMARY AND CONCLUSION</b>	<b>46</b>
	<b>BIBLIOGRAPHY</b>	<b>48</b>

<b>APPENDICES</b>	<b>53</b>
<b>APPENDIX-A</b>	<b>53</b>
A.1 Brain tumor dataset	53
A.2 Result of preprocessing	56
A.3 Result of skull removal images	59
A.4 Result of clustering	62
A.5 Result of segmentation	65

## LIST OF TABLES

<b>TABLE No.</b>	<b>TITLE</b>	<b>PAGE No.</b>
3.1	Comparison result of different filtering method	26
4.1	Accuracy	41
4.2	Elapsed Time	42
4.3	Tumor size	43

## LIST OF FIGURES

<b>FIGURE</b>	<b>TITLE</b>	<b>PAGE</b>
<b>No.</b>		<b>No.</b>
1.1	Structure of MRI imaging system	2
1.2	MRI scan image	3
1.3	Types of tumor	4
1.4	Post-contrast T1-weighted image of patient with glioblastoma	6
3.1	Steps in proposed HSOM based brain tumor detection	25
3.2	Filtered image	26
3.3	Skull removal image	27
3.4	Overview of cluster	28
3.5	Clustering techniques	29
3.6	Types of features	30
3.7	HSOM Taxonomy	33
3.8	Agglomerative	34
3.9	Thematic agglomerative	34
3.10	HSOM based on clusters	35
4.1	Sample MRI brain tumor images	37
4.2.a	Original image	39
4.2.b	Filtered image	39
4.3.a	Preprocessed image	40
4.3.b	Skull removal image	40
4.4	Clustered image	40
4.5	Segmented image	40
4.6	Step by step process of the proposed system	44