

# HYBRID APPROACH FOR MEASURING IQ BASED ON BRAIN STRUCTURE AND TEST SOLVING ABILITY

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**Abstract:** *The human brain is responsible for every human passion, human reaction, human logic and every human decision. One objective is to notice what is experienced in the brain and how this relates to a person's smartness. Recently, scientists mapped out the brain in terms of cognitive capacity. They needed to know how different parts of the brain were active to form the classic IQ scoring we watch on tests. Intelligent Quotient (IQ) is a score, which is commonly derived from a variety of tests, to assess human intelligence. Although the test-takers show varying scores when taking similar test at the various occasions or taking variety of tests at the same age, clinical psychologists in general regard IQ score as statistically accurate metric for clinical purposes. In our project we are mapping brain using following Techniques 1) Magnetic Resonance Imaging (MRI) image processing 2) Intelligent Quotient (IQ) test. We are developing java application for this operation.*

**Keywords**–IQ, MRI, Image processing, Brain mapping, White part, Black part, Cavities.

## I. INTRODUCTION

Understanding the human brain is one of the greatest challenges faced in the 21st century science. If we can rise to the challenge, we can gain fundamental insights into what it means to be human, develop new treatments for brain diseases, and build revolutionary new Information and Communication Technologies (ICT). Intelligent Quotient (IQ) is a score, which is commonly derived from various types of tests, to assess human. Why would researches live on the arduous work of brain mapping? The answer is simple, Lichtman: to know our brains intimately. We have never seen a chart of how all of the neurons in the brain attach. As Jeff Lichtman set it, "A lot of our brilliance about the brain is based on incomplete awareness of what is actually there. So we would like to notice what is actually there." Brain mapping is a technique used to display parts of the brain and how they work together. Although this may sound understandable, like all things related to the brain, it's a bit complicated. IQ test quizzes individuals in subjects like reading comprehensions, limits, series and mathematical knowledge, but they don't test for subjects that include mechanics, social skills, etc intelligence. However, the standard IQ tests are not applicable to infants or young children because of their questionnaire-based test, series. We should develop a large efficient technique to calculate current IQ or to predict planned IQ, it would hold big promises to analyse infants or children who may undergo unusual intellectual development, thus providing a chance to gather early interventions such as specially designed and tailored educations for them. IQ is a number meant to calculate people's cognitive abilities (intelligence) in relation to their age group. An IQ within 90 and 110 is advised average; over 120, superior. Roughly 68% of the public has an average IQ.

## Objective:

To develop IQ test.

- <sup>1</sup> To fetch MRI images of the brain.
- <sup>2</sup> To analyse the MRI images.
- <sup>3</sup> To predict the user's IQ level using MRI result and IQ test result combined.

## II. LITERATURE SURVEY:

Title	Author	Advantages	Limitations	Future Scope
MRI Brain Image Enhancement Using Filtering Techniques.[5]	E. Ben George, M.Karnan	removing noise from MRI brain images with high contrast	Difficult to measure the improvement in enhancement	In future, an easy MRI image enhancement algorithm or method can be developed
HIGH-DENSITY MAPPING OF BRAIN SLICES USING A LARGE MULTI-FUNCTIONAL HIGH-DENSITY CMOS MICROELECTRODE ARRAY SYSTEM.[3]	Vijay Viswam, RaziyeBounik, Amir Shadmani, Jelena Dragas	investigate and monitor position, size, morphology and electrical activity of brain slices	Mismatch in CMOS devices is relatively high. This is specially hindering the reliability of analog processing in vision chips	More further studies can be made using this technique
Detection of Brain Tumor from MRI Images Using MATLAB.[6]	Pooja Dang, JyotikaPruthi	The research was done for detection and extraction of tumor from the MRI image.	Not able to measure volume and size of tumor	In future the work will be extended to generate a new algorithm for volume calculation of the tumor region to analyze its size.
Proposal of a three-dimensional brain mapping system based on the quantitative analysis of the electroencephalographic signal	Mariana C. Melo, Túlio T. S. Del Claro, Ângela A. R. de Sá, Alcimar B. Soares,	evaluation of the EEG signals provided from many kinds of situations	The system only allows to view the EEG signals that are stored on the database	Brain disorders can be evaluate by the use of the quantitative EEG
A Novel MRI Brain Edge Detection Using PSOFM Segmentation and Canny Algorithm	RomeshLaishram, WahengbamKanan Kumar, Anshuman Gupta,	better edge detected image compared to GAFM segmentation Good detection, Good localization, Minimal response	For medical image processing the desired result should be highly objective.	The present work may be use as a preprocessing stage for further analysis
TRACKING DEVELOPMENTAL CHANGES IN SUBCORTICAL STRUCTURES OF THE PRETERM BRAIN USING MULTI-MODAL MRI	Ahmed Serag, Paul Aljabar, Serena Counsell, James Boardman, Jo V. Hajnal and Daniel Rueckert	useful in providing age-specific normal values for mechanistic studies of preterm brain injury	analysis framework is reliant on normalization accuracy	Future work will also make use of other modalities within our analysis framework as well as tracking signal intensity change in other brain structures.
Multislice Brain Mapping and Quantification of Perfusion MRI Data	UmutArioz, UgurBaysal, AysenurCila	User can achieve all operations easily easy-to-use interface.	need of transferring of the images to another media (PC, etc.); having less image processing functionalities and working without integrity with the PACS system for now.	Future work will also make use of new techniques to make image transferring process easier

Section I focuses on the introduction of understanding the human brain. It gives an overview of the brain related researches done in the past, their scope, advantages and limitations. Further section II focuses on our proposed system and its architecture wherein IQ is calculated using brain image processing (MRI) and IQ test (Question-answers). Section III focuses on feasibility study which is the complete study of the project in terms of input, processes, output, fields, programs and procedures. It also includes the advantages and disadvantages of the system along with its applications. The last section concludes the system in brief.

**III. PROPOSED SYSTEM**

**IQ test:**

A set of questions based on analogies, patterns, vision, logic, etc. are to be answered by the test taker (patient). His/her performance in the test will lead to a score i.e. result of IQ test.

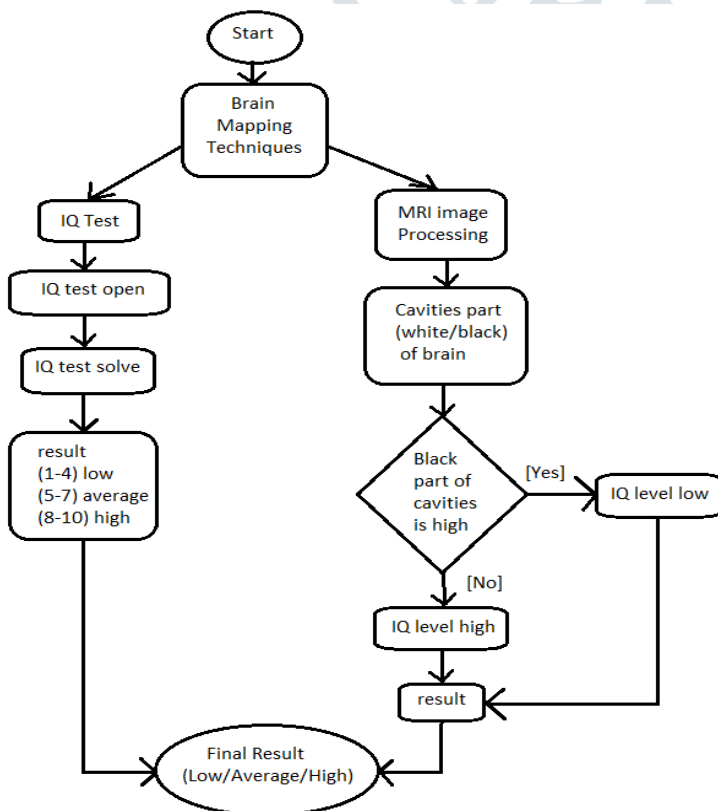
**MRI image processing:**

1. MRI of the test taker’s brain is given as an input to the system.

The brain image is scanned and analysed.

Analysed result is the result of MRI image processing.

Both the results are interpreted and a final result is displayed which is the IQ level of the test taker predicted by the system.



**IV. FEASIBILITY STUDY**

**Software Feasibility:**

- Java
- JDK

**Hardware Feasibility:**

- Processor - Pentium III

- Speed - 1.1 GHz
- RAM - 1 GB(min)
- Hard Disk - 20 GB
- Key Board - Standard Windows
- Power Supply

**V. RESEARCH METHODOLOGY**

**Data and Sources of Data**

For this study data has been collected from Bharati Hospital in Pune. In Bharati hospital we met Dr. Karan Deshpande sir and explained our project in detail and took consultation for our project. Dr. Karan Deshpande was satisfied with the explanation of our project and agreed to share data with us.

**Use case diagram:**

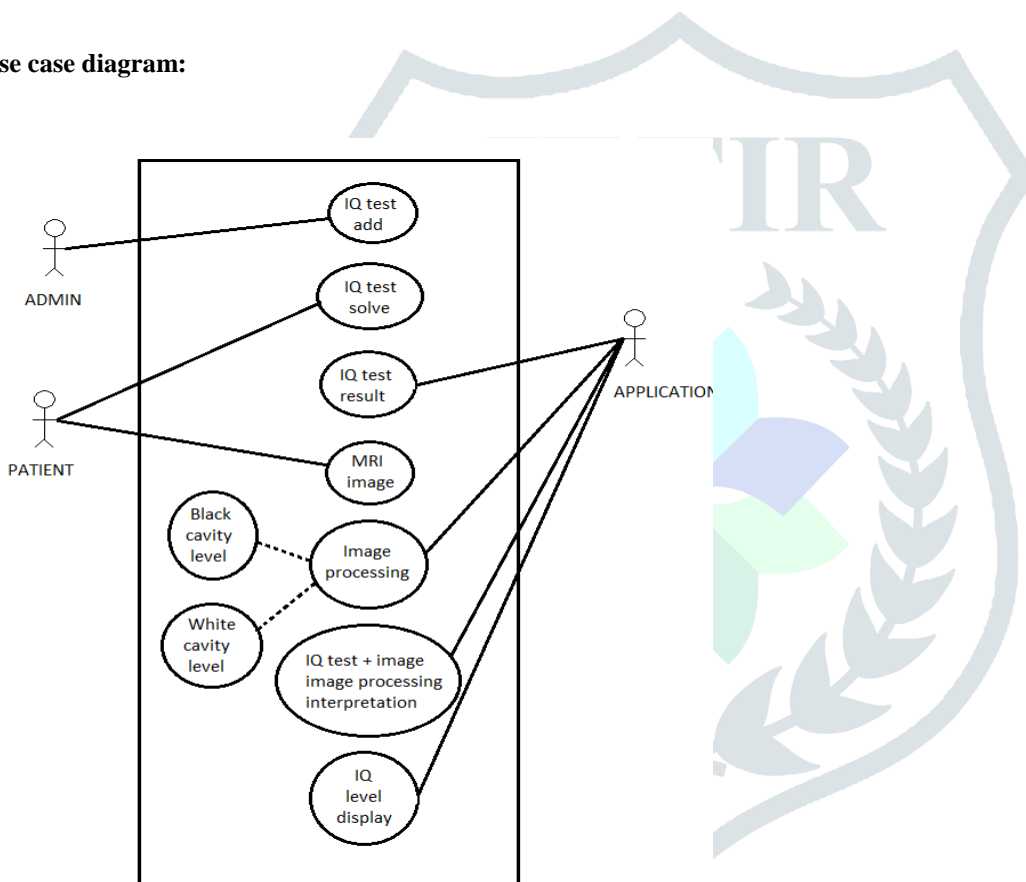


Fig- a) use case diagram

**Use Case Specification:**

Use Case Name:	IQ Test Solve	IQ Test Add
Actor(s):	Patient	
Summary Description:	Patient Solve IQ test	
Pre-Condition:	Valid IQ test should be present in application	
Post-Condition(s):	Test solved successfully	
Basic Path:	<ul style="list-style-type: none"> <li>• Patient login using the username and password</li> <li>• Patient opens IQ test</li> <li>• Patient solves IQ test</li> <li>• Submits test</li> </ul>	

Use Case Name:

Actor(s):	Admin
Summary Description:	Add different IQ test in Application
Pre-Condition:	
Post-Condition(s):	Test added successfully
Basic Path:	<ul style="list-style-type: none"> <li>• Admin enters the name of IQ test</li> <li>• Admin enters size of IQ test</li> <li>• Admin enters IQ test details</li> <li>• Add IQ test</li> </ul>

Use Case Name:	IQ Score Result
Actor(s):	Application
Summary Description:	Display result of IQ test
Pre-Condition:	Test should be solved and submitted successfully
Post-Condition(s):	IQ test score Displayed
Basic Path:	Check test questions solved <ul style="list-style-type: none"> <li>• Calculate correct no of Answers</li> <li>• Display total score</li> </ul>

Use Case Name:	IQ Level Display
Actor(s):	Application
Summary Description:	Display IQ level of patient
Pre-Condition:	Patient has to give IQ test and MRI image of his/her brain
Post-Condition(s):	IQ level Displays
Basic Path:	Patient Gives IQ test <ul style="list-style-type: none"> <li>• Patient's MRI brain image given as input</li> <li>• Interpretation of total IQ score</li> </ul>

IQ level of Brain is dependent on total number of black cavities and white cavities present in the brain.

If white cavities are higher than black cavities, then IQ score of patient is high. If black cavities are higher than white cavities, then result of IQ score of patient is low.

Use Case Name:	IQ test + Image Processing Interpretation
Actor(s):	Application
Summary Description:	Interprets both Score Results from IQ test and Image Processing
Pre-Condition:	Score Results from IQ test and Image Processing
Post-Condition(s):	Final IQ Score of patient
Basic Path:	Check score of IQ test <ul style="list-style-type: none"> <li>• Check score of Image processing</li> <li>• Interprets total IQ score</li> </ul>

## VI. RESULTS AND DISCUSSION

In this system, android based application measure the IQ level of human brain. IQ test and MRI image technique arranged for human brain mapping. In our project firstly we collect IQ test of patient . In that IQ test, patient need to solve ten questions and result of IQ test is depend on patient answer. We collect patient brain image and compare this image with MRI image. Calculate the number of black and white cavities in that image.

Advantages:

- Brain imaging is used in treatment.
- Helps identify students at risk.

Disadvantages:

- The cost of MRI is high.

Applications:

- 1) Used in military recruiting.
- 2) It is used to diagnose neurodegenerative diseases.
- 3) Can be used by any firm that needs to hire people with a certain minimum IQ level.

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