OBJECT ORIENTED STRUCTURE MEASUREMENT OF SPL-I

SE 3204 - Software Metrics Lab

Submitted By:

Sanjatul Hasan Siam	**ASH1925023M**
Abdullah Al Tahmid	**ASH1925014M**

MARCH 4, 2023

Contents

List of Tables:

Introduction

CBO, RFC, MPC, DIT, NOC, LCOM are calculated below for SPL- I project "***Voice Aided Smart Attendance System"***.

CBO:

Coupling between objects (CBO) is a measure of how tightly coupled a group of objects or classes are to each other. It refers to the level of dependence between two or more objects, and the extent to which changes in one object require changes in the other.

High coupling means that objects are highly dependent on each other and that a change in one object is likely to affect many other objects in the system. On the other hand, low coupling means that objects are relatively independent of each other, and a change in one object is unlikely to affect other objects in the system.

RFC:

RFC stands for "*Response for a Class*" and is a software metric used to measure the number of unique methods that can be executed in response to a message received by an object of a class. In simpler terms, it measures the number of methods that can be invoked by an object in response to a message.

The higher the value of RFC, the more complex the class is, and the more potential paths of execution it has.

MPC:

MPC stands for "*Message Passing Coupling*" and is a software metric used to measure the degree of coupling between objects in an object-oriented software system. It measures the number of messages that are passed between objects in a class, indicating the extent to which objects are dependent on one another to perform their respective functions.

High MPC values indicate that there are many messages being passed between objects, which can result in a tightly coupled system that is difficult to maintain, modify, and test.

DIT:

DIT stands for "*Depth of Inheritance Tree*" and is a software metric used to measure the depth of the inheritance hierarchy for a given class in an object-oriented software system. It is a measure of the number of super classes that a class has, either directly or indirectly. A high DIT value indicates that the class has a long inheritance chain, meaning that it inherits many properties and methods from its super classes.

NOC:

NOC stands for "*Number of Children*" and is a software metric used to measure the number of immediate subclasses that inherit from a particular class in an object-oriented software system. In other words, it measures the number of classes that are directly derived from a given class.

A high NOC value indicates that a class has many direct subclasses, which can make it more complex and difficult to understand, maintain, and modify.

LCOM:

LCOM stands for "*Lack of Cohesion of Methods*" and is a software metric used to measure the degree to which the methods of a class are related to each other. It is a measure of the functional cohesion of a class.

A high LCOM value indicates that a class has low cohesion, meaning that its methods are not well-organized and do not work closely together to achieve a common purpose.

WMC:

WMC stands for "*Weighted Methods per Class*" and is a software metric used to measure the complexity of a class in an object-oriented software system. It is a measure of the total number of methods in a class, weighted by their complexity.

A high WMC value indicates that a class has many methods, and these methods are complex, making it more difficult to understand, maintain, and modify. On the other hand, a low WMC value indicates that a class has fewer methods, and these methods are less complex, which can lead to simpler, more manageable code.

The value of CBO:

No.	Class Name	Value of CBO
1	HammingWindowFunction	0
2	HannWindowFunction	1
3	WindowFunction	0
4	DiscreteAutocorrelationAtLagJ	0
5	LinearPredictiveCoding	1
6	ChebyshevDistanceCalculator	1
7	DistanceCalculator	0
8	EuclideanDistanceCalculator	1
9	Normalizer	0
10	LpcFeaturesExtractor	4
11	WindowedFeaturesExtractor	1
12	FileHelper	0
13	AutocorrellatedVoiceActivityDetector	0
14	CheckAttendance	0
15	CreatingAttendanceSheets	0
16	creatingIDPass	0
17	DisplayAttendance	0
18	IdCheck	0
19	IdPassReader	0
20	IdPassWritter	0
21	MatchResult	0
22	ModifyPassWord	0
23	Recognito	2
24	Record	0
25	Tester	4
26	VoicePrint	0
27	AfterEnroll	8
28	AfterLogin	11
29	Alertframe	1
30	Attendance	0
31	Button_templete	0
32	GiveVoice	6
33	IdPassModifier	5
34	LogIn	5
35	Main	3
36	StudentLogIn	3
37	TeacherEnroll	5
38	TeacherLogIn	4
39	TeacherPanel	11

Table 1 CBO Values for Voice Aided Smart Attendance System

The value of RFC and MPC

No.	Class Name	Value of RFC	Value of MPC
1	HammingWindowFunction	3	2
2	HannWindowFunction	6	5
3	WindowFunction	3	2
4	DiscreteAutocorrelationAtLagJ	1	0
5	LinearPredictiveCoding	7	6
6	ChebyshevDistanceCalculator	2	1
7	DistanceCalculator	2	0
8	EuclideanDistanceCalculator	2	0
9	Normalizer	3	2
10	LpcFeaturesExtractor	6	4
11	WindowedFeaturesExtractor	5	2
12	FileHelper	13	11
13	AutocorrellatedVoiceActivityDetector	18	9
14	CheckAttendance	2	0
15	CreatingAttendanceSheets	3	0
16	creatingIDPass	4	0
17	DisplayAttendance	2	0
18	IdCheck	1	0
19	IdPassReader	2	0
20	IdPassWritter	2	0
21	MatchResult	3	0
22	ModifyPassWord	2	0
23	Recognito	12	4
24	Record	1	0
25	Tester	4	2
26	VoicePrint	5	1
27	AfterEnroll	3	2
28	AfterLogin	2	1
29	Alertframe	1	0
30	Attendance	2	0
31	Button_templete	3	0
32	GiveVoice	1	0
33	IdPassModifier	5	4
34	LogIn	2	1
35	Main	1	0
36	StudentLogIn	2	2
37	TeacherEnroll	4	3
38	TeacherLogIn	2	2
39	TeacherPanel	7	3

Table 2 RFC & MPC Values for Voice Aided Smart Attendance System

The value of DIT

No.	Class Name	Value of DIT
1	HammingWindowFunction	1
2	HannWindowFunction	1
3	WindowFunction	0
4	DiscreteAutocorrelationAtLagJ	0
5	LinearPredictiveCoding	0
6	ChebyshevDistanceCalculator	1
7	DistanceCalculator	0
8	EuclideanDistanceCalculator	1
9	Normalizer	0
10	LpcFeaturesExtractor	2
11	WindowedFeaturesExtractor	1
12	FileHelper	0
13	AutocorrellatedVoiceActivityDetector	0
14	CheckAttendance	0
15	CreatingAttendanceSheets	0
16	creatingIDPass	0
17	DisplayAttendance	0
18	IdCheck	0
19	IdPassReader	0
20	IdPassWritter	0
21	MatchResult	0
22	ModifyPassWord	0
23	Recognito	0
24	Record	0
25	Tester	0
26	VoicePrint	0
27	AfterEnroll	1
28	AfterLogin	1
29	Alertframe	1
30	Attendance	0
31	Button_templete	0
32	GiveVoice	1
33	IdPassModifier	1
34	LogIn	1
35	Main	1
36	StudentLogIn	1
37	TeacherEnroll	1
38	TeacherLogIn	1
39	TeacherPanel	1

Table 3 DIT values for Voice Aided Smart Attendance System

The value of NOC

No.	Class Name	Value of NOC
1	HammingWindowFunction	0
2	HannWindowFunction	0
3	WindowFunction	2
4	DiscreteAutocorrelationAtLagJ	0
5	LinearPredictiveCoding	0
6	ChebyshevDistanceCalculator	0
7	DistanceCalculator	2
8	EuclideanDistanceCalculator	0
9	Normalizer	0
10	LpcFeaturesExtractor	0
11	WindowedFeaturesExtractor	1
12	FileHelper	0
13	AutocorrellatedVoiceActivityDetector	0
14	CheckAttendance	0
15	CreatingAttendanceSheets	0
16	creatingIDPass	0
17	DisplayAttendance	0
18	IdCheck	0
19	IdPassReader	0
20	IdPassWritter	0
21	MatchResult	0
22	ModifyPassWord	0
23	Recognito	0
24	Record	0
25	Tester	0
26	VoicePrint	0
27	AfterEnroll	0
28	AfterLogin	0
29	Alertframe	0
30	Attendance	0
31	Button_templete	11
32	GiveVoice	0
33	IdPassModifier	0
34	LogIn	0
35	Main	0
36	StudentLogIn	0
37	TeacherEnroll	0
38	TeacherLogIn	0
39	TeacherPanel	0

Table 4 NOC values for Voice Aided Smart Attendance System

The value of LCOM

No.	Class Name	Value of LCOM
1	HammingWindowFunction	1
2	HannWindowFunction	1
3	WindowFunction	0
4	DiscreteAutocorrelationAtLagJ	-1
5	LinearPredictiveCoding	0
6	ChebyshevDistanceCalculator	-1
7	DistanceCalculator	-1
8	EuclideanDistanceCalculator	-1
9	Normalizer	-1
10	LpcFeaturesExtractor	0
11	WindowedFeaturesExtractor	.5
12	FileHelper	-1
13	AutocorrellatedVoiceActivityDetector	0
14	CheckAttendance	-1
15	CreatingAttendanceSheets	-1
16	creatingIDPass	-1
17	DisplayAttendance	-1
18	IdCheck	-1
19	IdPassReader	-1
20	IdPassWritter	0
21	MatchResult	0
22	ModifyPassWord	-1
23	Recognito	0.153846
24	Record	0
25	Tester	0
26	VoicePrint	0
27	AfterEnroll	.6
28	AfterLogin	.875
29	Alertframe	-1
30	Attendance	.6
31	Button_templete	.667
32	GiveVoice	1
33	IdPassModifier	.5
34	LogIn	.8
35	Main	1
36	StudentLogIn	.75
37	TeacherEnroll	.8
38	TeacherLogIn	1
39	TeacherPanel	.25

Table 5 LCOM values for Voice Aided Smart Attendance System

The value of WMC

No.	Class Name	Value of WMC
1	DiscreteAutocorrelationAtLagJ	3
2	LinearPredictiveCoding	10
3	HammingWindowFunction	4
4	HannWindowFunction	4
5	WindowFunction	5
6	CheckAttendance	7
7	CreatingAttendanceSheets	18
8	creatingIDPass	6
9	DisplayAttendance	3
10	IdCheck	3
11	IdPassReader	4
12	IdPassWritter	2
13	MatchResult	4
14	ModifyPassWord	3
15	Recognito	27
16	Record	3
17	Tester	11
18	VoicePrint	9
19	ChebyshevDistanceCalculator	4
20	DistanceCalculator	3
21	EuclideanDistanceCalculator	4
22	Normalizer	6
23	TeacherLogIn	8
24	LpcFeaturesExtractor	6
25	WindowedFeaturesExtractor	8
26	FileHelper	7
27	AutocorrellatedVoiceActivityDetector	28
28	AfterEnroll	13
29	AfterLogin	8
30	Alertframe	2
31	Attendance	13
32	Button_templete	3
33	GiveVoice	4
34	IdPassModifier	12
35	LogIn	9
36	Main	4
37	OpenTextFile	1
38	StudentLogIn	6
39	TeacherEnroll	9

Table 6 WMC values for Voice Aided Smart Attendance System