SLIIT

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SESSION ON ASSIGNMENT 3

Assignment 3

- Write a research paper based on the proposed system, using the template provided on the Course Web module page. In addition, ensure that the research paper is written by adhering to the points stated in the ‘Guidelines’ file available in the Course Web module page.

Guidelines

- Has the first letter of each word in the paper title been capitalized, except for prepositions?

Sample Title of Research Paper

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Guidelines

- Is the abstract section free of abbreviations?

***Abstract*—Use this document as an instruction set. The electronic file of your paper will be formatted further at IEEE. Paper titles should be written in uppercase and lowercase letters, not all uppercase. Avoid writing long formulas with subscripts in the title. Put a space between authors' initials. The abstract must be a concise yet comprehensive reflection of what is in your article. In particular, the abstract must be self-contained, without abbreviations, footnotes, or references. It should be a microcosm of the full article. The abstract must be between 150–250 words. Be sure that you adhere to these limits. Otherwise, you will need to edit your abstract accordingly. The abstract must be written as one paragraph, and should not contain displayed mathematical equations or tabular material. The abstract should include three or four different keywords or phrases, as this will help readers to find it. It is important to avoid over-repetition of such phrases as this can result in a page being rejected by search engines. Ensure that your abstract reads well and is grammatically correct.**

***Keywords*—component, formatting, style, styling, insert** *(key words)*

Guidelines

- Are terms spelled out with their abbreviations in parentheses upon first mention in the body of the paper?

1. Introduction

At present, with the rise and application of multimedia technology, it is a great challenge to provide more reliable technical support and strong technical support for the development of multimedia software. At the same time, object-oriented technology has become the mainstream of current software development, which is suitable for developing multimedia software, for example, using the image processing software Adobe Photoshop developed by C++, using Action Script to develop animation processing software Flash, and using C++ for the Jedi survival and heroic alliance games.

We must point out that multimedia software is a typical complex system; therefore, how to scientifically measure the complexity of multimedia software plays a vital role in developing high-quality multimedia software. Software metrics has become the important and long-term focused research field of software engineering and also became an important and effective method in assessing and predicting software development activities. The purpose of software metrics research is to provide guidance for developing high-quality software [1].

Since the concept of software measurement was first proposed by Rubey R. J. and Hartwick R. D. in 1968[2], the researches, development, and applications have been carried out for more than fifty years. Through literature review, this paper found that previous researches mainly from internal attributes, external attributes, and other aspects of the research of software quality metric. Over these years, many scholars have made a broad and deep research on the software quality metric and prefer to find the key or the important software quality measurement factors from the inner elements of software itself. The factors were measured or counted directly or indirectly to construct the corresponding metric model. Early metrics on structured programs were primarily focused on Lines of Code (LOC) [3], McCabe coloring graph method [4], Function Point Analysis (FPA) [5], etc.

In 1994, Chidamber S. and Kemerer C. proposed a CK metrics set for object-oriented software quality metrics research. The Weighted Methods per Class (WMC), Number of Children (NOC), Depth of Inheritance (DIT), Coupling Between Objects (CBO), Lack of Cohesion (LCOM), and Response for a Class (RFC) are included in set, which are the fundamental of object-oriented software quality metrics.

Guidelines

- Are abbreviations of the terms used throughout all sections of the paper after their first mention?

H. User Interaction Flow

As depicted in Fig. 1, the user interaction flow of the system encompasses three key functionalities: Math Object Detection Model (MODM), Laboratory Equipment Detection Model (LEDM), and Currency Recognition Model (CRM), each designed to cater to the unique educational needs of blind and visually impaired students. Students can quickly navigate between these elements from the main menu upon launching the mobile application.

In MODM, students select geometric objects to examine and capture images with camera-equipped smart glasses. The system uses the YOLO object detection paradigm for real-time detections and provides auditory feedback including the name, characteristics, and relevant mathematical equations for calculating parameters such as area, perimeter, and volume. This interactive approach promotes independent learning and comprehension of geometric concepts.

Similarly, students can access LEDM from the application's home page. Once there, users can guess the name of the object by interacting with its interfaces and engaging with science laboratory equipment. Upon accurately guessing an object's name, the system emits an alert stating, "You are correct." If the guessed name is incorrect, the system provides audio feedback, "You are wrong," followed by the correct name and a random description of the particular object.

Guidelines

- Are all the sources cited in the body of the paper listed in the reference section?
- Are all the references formatted according to the IEEE guidelines.
- Does the research paper include a minimum of 10 references, with majority of them being from reliable sources such as conferences, journals, and books?

Complexity metrics have a lot of potential uses which include: provision of feedback during a software project to help control the design activity, and provision of detailed information about software modules to help pinpoint areas of potential instability during testing and maintenance. Cyclomatic complexity is the most widely used complexity metric for computer software [12]. It is a software metric that provides a quantitative measure of the logical complexity of a program. The introduction of cognitive informatics to the software engineering domain through the work of Wang [13] has brought about the emergence of a new set of complexity metrics referred to as cognitive complexity metrics. These metrics introduce cognitive weights – which define the effort required, relative time or extent of difficulty in comprehending software. In cognitive informatics, the functional complexity of software in design and comprehension depends on three key elements namely: its input, internal processing and output [14]. Initially three basic control structures (BCS), branch, iteration and sequence were identified [15]. However, the work of Shao and Wang [14] modified these BCSs and introduced what obtains in Table 1. These BCSs are the fundamental logic building blocks of software.

REFERENCES

[11] T. J. McCabe and A. H. Watson, "Software complexity," *Crosstalk*, vol. 7, no. 12, pp. 5–9, 1994.

[12] R. S. Pressman, *Software Engineering: A Practitioner's Approach*. New York, NY, USA: McGraw-Hill, 2005, pp. 649–672.

[13] Y. Wang, "On the cognitive informatics foundations of software engineering," in *Proc. ICCI*, 2004, pp. 22–31.

[14] J. Shao and Y. Wang, "A new measure of software complexity based on cognitive weights," *Electr. Comput. Eng., Can. J.*, vol. 28, no. 2, pp. 69–74, Apr. 2003.

[15] C. A. R. Hoare *et al.*, "Laws of programming," *Comms ACM*, vol. 30, no. 8, pp. 672–686, Aug. 1987.

Guidelines

- Has the phrase ‘et al.’ been written in italics?

II. Related Works

Before the 21st century, many metrics were proposed to measure software complexity. Among the most widely used were McCabe’s Cyclomatic complexity [5], Halstead complexity [6], and Line of Code. On other hand, few studies were conducted to compare between different complexity metrics to determine which metric is more suitable to be considered in software engineering.

Graylin Jay *et al.* [4] made a comparison between two metrics to calculate the complexity of code. They used Cyclomatic Complexity (CC) and Line of code (LOC) to prove the stable linear relationship between these two techniques. They used five NASA projects with different programming languages, such as C, C++, and Java, to be the dataset for their research. Finally, they found that these two measurements are severely underestimated and CC does not have any different features from the LOC.

Min Zhang *et al.* [7] studied the performance of three complexity metrics. They selected McCabes Cyclomatic

Guidelines

- Has the paper written in third person writing style instead of first person?
  - **First Person** : We conducted an in-depth analysis of the theoretical framework to arrive at meaningful conclusions for the research.
  - **Third Person** : An in-depth analysis of the theoretical framework was conducted to arrive at meaningful conclusions for the research.

Guidelines

- Are all figures, tables, and equations introduced in the text before their appearance?

2.3 The architecture of the system

The current architecture and deployment model is presented in Fig. 2.

There are three key elements namely: our proxy, Apache Kafka,[3] and Apache Spark.[4] Of course, other platforms, e.g. such as Kibana[5] can be also used.

The proxy implements the interface to the external project management tools (currently GitLab and SonarQube). It is responsible for connecting (e.g. via VPN), downloading the data, preliminary pre-processing, and removing sensitive data. The proxy also provides graphical user interface (GUI) for data visualization and system configuration.

The Apache Kafka publish-subscribe system is used to communicate with Apache Spark. In particular, the preprocessed data is published at a specific Kafka topic and further consumed by the Apache Spark framework, where complex and more sophisticated data processing patterns can be used.

Such approach allows for big data processing that will be useful and required to analyze large projects at large organizations.

The proxy design pattern for data gathering has been used in the proposed architecture due to the privacy reasons. When we consulted this architecture with our possible

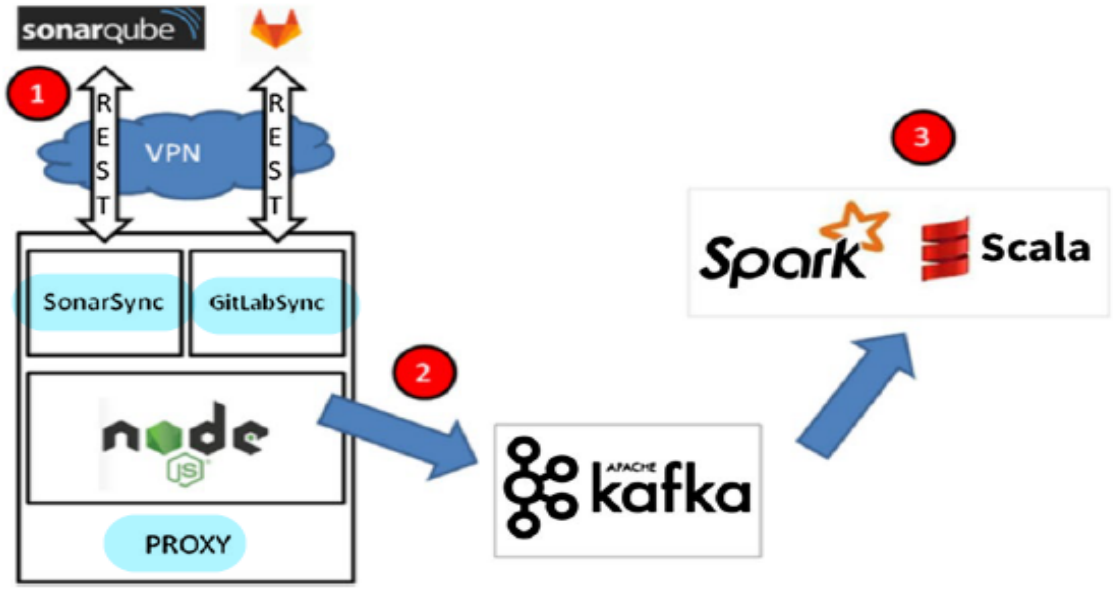

Fig. 2 The conceptual architecture of the proposed solution.

Guidelines

- Is the text in figures and tables clearly visible when the document is viewed at 100% zoom level?

[9] [10], this dataset is a collection of fifteen programs that are written in Java programming language. We choose one programming language to avoid any complexity differences in the syntax of different programming languages. Table I shows the statistical of dataset collection.

TABLE I. THE STATISTICS OF DATASET COLLECTIONS

	Min	Max
Line of code	*18*	*677*

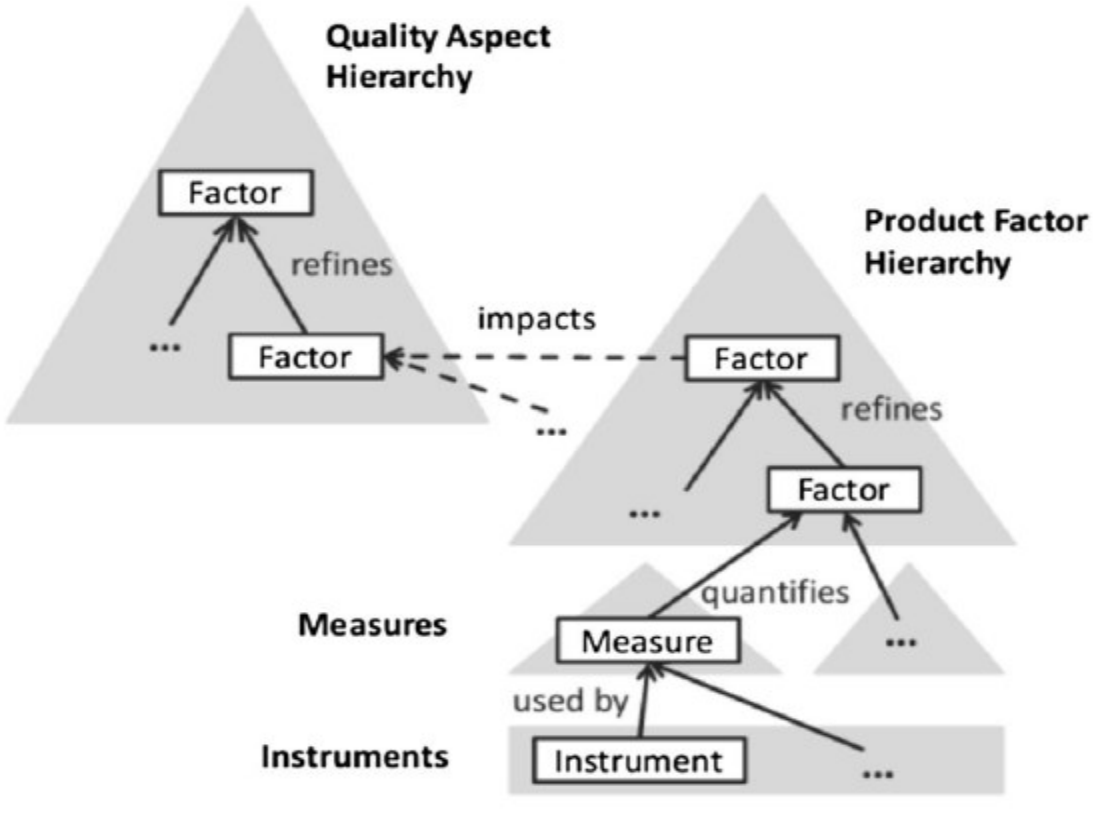

Fig. 10 The quality model concept

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- Have the equations in the paper been numbered??

Cyclomatic is one of the most popular complexity metrics that uses a flow chart to represent application execution steps. There are many techniques to calculate program Cyclomatic complexity. The first one by a direct graph that has a number of nodes and edges. There are two types of nodes in this direct graph: normal nodes and predict nodes. The normal nodes are nodes that have one output, and those nodes are used to represent loops and end of function domain. On the other hand, the predict nodes are nodes which have two or more outputs and are used to represent a control keywords such as an IF statement, SWITCH, and TRY-CATCH statement [4]. Fig. 1 shows this representation. After drawing the direct graph of an application, the Cyclomatic complexity of application was calculated by (1).

$$\text{Cyclomatic complexity} = E - N + 2P \qquad (1)$$

where:

E is the number of edges in direct graph.
N is the number of normal nodes.
P is the number of predict nodes

Content of a research paper

- Abstract - Provides a concise summary of the key points of the paper, including the research problem, objectives, methods, results, and conclusions.
- Introduction - Provides an overview of the background of the topic, problem statement, significance of the research, research questions, and a preview of the remaining sections of the paper
- Literature review - Summarizes existing research on the topic
- Methodology - Explains the research design and procedures
- Results - Presents the findings of the study
- Discussion - Interprets and contextualizes the results considering the research questions and existing knowledge
- Conclusion - Summarizes the key findings, interpret their implications, and provide practical recommendations for future research or practice
- Reference - Lists the sources cited in the research paper

Abstract Vs Conclusion

Aspect	Abstract	Conclusion
Length	Usually limited to 150-250 words, depending on the journal or conference requirements.	Can vary in length depending on the complexity of the study, but typically longer than the abstract.
Content	Provides a brief summary of the research problem, objectives, methods, results, and conclusions of the study.	Summarizes the key findings of the study and explains their implications, limitations, and recommendations for future research or practice.
Audience	Intended for readers who want to quickly understand the main points of the paper before reading the full text.	Intended for readers who have already read the full paper and want to understand the main implications and contributions of the study.