SOFTWARE ENGINEERING WITH JAVA:
PASSING CARS PROBLEM CASE

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Abstract. This paper analyses beginners and experts who can safely adapt and develop their skills to new technology with Java. In this paper, we were discussing software engineering scope and build their competency step by step and to be clear all quires follow the different options. In the first part of the paper, you will get a general idea about software engineering and how we can build up the application with Java, and about its boundaries and history of Java. In the second part of the paper, we discussed results, as a result, we were discussing main points briefly. We were discussing new technology, share problems, practical knowledge, and generate new ideas with figures. Inside those points, we were discussing Java development kit, Object-Oriented Programming (OOP), Spring framework, Database, data types, real work and some interesting topics which are very helpful for making software. We also discussed some online site for Java Software developer. Finally, you will see we solved one real problem in this paper. We provide problems, Java code, and output within the figures. We also discuss the problem of how we can face it in our daily life and how we can solve it within a short time. Nowadays, almost everything is related to technology that's why this study emphasizes the need to consider.

Introduction. Software engineering is a systematic and disciplined approach to developing software [1]. It applies both computer science and engineering principles and practices to the creation, operation, and maintenance of software systems. Software engineering needs software engineers who can use knowledge of engineering principles and programming languages to build software products, develop computer games, business work (Android, IOS, desktop application and run network control systems for people to make life easier). “In the software engineering approach several models for the software life circle are defined, and many methodologies for the definitions and assessment of the different phases of a life-circle model” [2].

Every application follows some specific criteria to develop any software. Firstly, software requirement is about analysis, specification, and validation. Secondly, its application is going to design according to client requirements. Thirdly, the development of the main activity for software it is a combination of programming, verification, testing, debugging. Fourthly, testing is an empirical, technical
investigation according to the client’s requirements and quality. Final stage about maintaining the activities required to provide cost-effectively and shipping the product.

The programming language Java was first introducing to early 1991 when a group of engineers led by J.Gosling, at Sun Microsystems was formed to explore opportunities in the consumer electronics market. In Java, the syntax is almost similar with C and C++. When you will be programming with C and C++ you will see most of the problems you will face about memory allocation but in Java you will not face this problem because JRE helps to make memory allocation automatically. Before 1995, Java was introduced as ‘Oak’ but beginning of the 1995 it was changed and fixed the name Java [3].

**Theoretical framework.** The Java development structure is divided into four parts: practical knowledge, generate new idea, new technology, share problem.

The first one is practical knowledge which is based on different programming areas like Java programming language. Generate new ideas is the second one, it means to generate some plan and design diagram then it is possibly easy to implement it properly. The third one is a new technology, always be up to date because in everyday life something is coming new to make our work easier and sometimes old versions of technology does not support all the features properly. Finally, share problems, nowadays there is a lot of online sites to share knowledge and take some challenges. We can share our problem and we can get back some good solution according to our problem which helps to increase our competence.

Practical knowledge is especially important for a developer. It helps to get more confident to develop software and increase knowledge. Because of practice, they know how the program is working and how we should do it. In Java, there is a lot of syntax for example data types, class, interface, fields, methods, and algorithm. If you will not have any practical knowledge then you will never know how it can be organized and how it will be working and when you have to use what sort of data type, what sort of field you should take for the specific class. If you want to be a software engineer, then you should practice more and more. Practical knowledge helps you to generate new ideas and solve the same problem in different ways and show the same output. Java is a structural language if you want to know the structure then you should go to practice. There is a lot of ways to practice and develop your Java programming skills. You will see in the 20th of the century there is a lot of online development site where you can solve the problem and take the challenge, build up some small project which will help you to know better programming. You can also develop some of your interests in a programming way: data camp, code academy, Udemy, code war, etc.

After developing your program, you can test it, is it running according to your expectation or not. And try to generate a new idea of what you can do with it. Implement it more effective way. You can design one program in a different way that’s why you at first you should find out the more effective and smooth idea then you can develop your idea and it will work according to client requirement. If you have some better idea than your client, then you can share it and present it to your client.

Now we are in the 21st century and there is a lot of new technology in the world. In Java programming language there is a lot of change and add a lot of new technology. Now Java is own by oracle technology. When oracle owns Java from
that time, we are getting keep updating every three months. Now JDK 13 is available to use for developing but JDK 11 is more effective then JDK 13. Because JDK 11 supports all the features properly. And still JDK 8 also extremely popular. In JDK 8 you will get extra advantage about Lambdas, type annotations etc.. JDK 9 also came to take with extra some features like Modules, private methods in interfaces and so on. JDK 10 came with Local variable type inference. JDK 11 with extra Local variable syntax for lambda parameters. JDK 12 no extra new features yet, and JDK 13 with Switch expressions, text blocks [4].

We should always concern about new technology because when new technology in coming then old one is not working properly. There is some Integrated Development Environment (IDEA) For developing the program. Basically, we develop our program to using IntelliJ and Eclipse. Java is an immensely powerful and most organized programing language because of Object-Oriented Programming (OOP). Because of OOP we can easily connect with one class with another and we can make a relationship between class, we can also use one class element in another class. There is some popular concept in OOP. Class is one of them. Class in the blueprint in Java programming language. It contains [5]: fields, methods, constructors, blocks, nested class, and interface. The object is an entity that has state and behavior (for example, pencil, book, car, etc.). An Object has three characteristics: state – open bank account; behavior – deposit, withdraw, etc.; identity – JVM identifies each object uniquely.

The constructor is crucially important to make an object. If we will not define any constructor, then automatically one constructor is defined to proceed work. It contains all defined fields and parameters. The constructor can be overloaded if needed. Inheritance is especially important for OOP too. Through this, we can inherit parent class reference to store sub-class objects. For inheriting one class to another we used extends keyword. Through this, we can use parent class elements to the child class.

Another most important concept is composition. The design technique to implement – a relationship in classes. In this place, we can take how many classes we need to creating object composition for code reuse. When you will call the main class inside the main class then you will get all access from the subordinate classes. IntelliJ IDEA is a powerful integrated development environment (IDEA) written in Java and Kotlin for developing computer software. It is developed by JetBrains and is available as an Apache 2 Licensed community edition. There are 2 types of environment in IntelliJ IDEA one is Ultimate version for web and enterprise development it is paid version, and another one is Community version for JVM and Android development it is free. For, the beginner community version is the best choice because you can get it free and you can learn almost everything about IntelliJ IDEA. Through this IDEA you do not need to type all text you will just give hints and it will generate your sentence automatically. But there is one problem in IntelliJ IDEA it can’t generate bean automatically. You should generate is by yourself. Except for that issue IntelliJ is the best IDEA for Java developer.

Eclipse is another popular IDEA for Java developers. It can generate bean by itself. For this reason, now most of the company use this IDEA. When it can generate bean by itself that time there is less chance to get wrong that is why it’s shown less error then create my developer.
REST stands for Representational State Transfer [6]. REST is a technology relies on a stateless, client-server, cacheable communications technology that uses the HTTP protocol. In REST, web services are viewed as resources and can be identified by their URLs. Web service clients that want to use this resource and access a representation will need to use a globally defined set of remote methods that describe the action to be performed on the resource [7; 8]. Spring Framework was created by R.Johnson and released under Apache 2.0 license [9]. It is an important and useful application development framework for enterprise Java. It provides to create high performing; easily testable and reusable code and it is organized in a modular fashion [10].

There are a lot of important packages (fig. 1): The Core package (the basic concept is the BeanFactory); Spring’s Web package; Spring’s MVC package (Model-View-Controller); The DAO package (plain old Java objects).

We can share our problem in GitHub or Stack Overflow. And we can get a solution from different developers. And you can share your problem with your co-worker, your supervisor, senior then we will get a solution. Asking a question is one of the best ways to learn properly. When you can find out the problem then you will get the opportunity to solve it and make you more organized.

GitHub is a powerful site for programmers. Programmers can upload their projects on this site to evaluate their skills. You will get feedback from an expert. Nowadays, it’s very essential for getting a job because most of the companies ask about the GitHub link to get an idea about candidate programming skills. When you will search any project on this site you will get a lot of suggestions according to your questions and you can check which one is perfect for you and you can pick it up from that site and you can develop it.

Stack Overflow is the most popular question and answer site for professional and enthusiast programmers. It’s very helpful to get the best answer and it’s very reliable. It is available in different languages like in English, Spanish, Russian, Japanese. It is created by J.Atwood and J.Spolsky [11]. When you are going to search for anything in Google search engine related to programming then you will see first or second suggestion from google is stack overflow. You can easily pick up your solution from this site.

There is also some popular sites for software developers like Reddit, Code Ranch, Stack Exchange, programmers Heaven and so on (fig. 2). Which is helpful to
get an accurate answer to your questions. You will get a lot of solutions from different aspects.

Fig. 2. Software developers’ sites

**Practical results.** In fig. 3 the Passing Cars problem is demonstrated. In a traffic controlling system, most of the time controllers need a database about the different routes (how many cars are daily passing and which route is more / less busy). Thanks to this program everybody can easily count and find out which route they should concern more.

Fig. 3. Pairs of passing car counting
Fig. 4 shows how many cars are passing each other from east to west and west to east. For example, from the east, it will count 0 and west it will count 1 and count total pairs. For this, it was used solution with return type method and assign to variables with data types (initial value is 0). It was used for loop, three conditions, and process the assigning variable according to requirement and provide us the Boolean result, finally, it was returning the count variable.

After that, this method will provide how many pairs of cars are passing from different directions. According to the tasting, we got the below result (fig. 5). In this output, it's indicated total of 5 pairs of cars were passing.

```java
package prefixSums;

public class PassingCars {

    public static void main(String[] args) {
        System.out.println(solution(new int[]{0, 1, 0, 1, 1}));
    }

    public static int solution(int[] A) {
        int countOfZero = 0;
        int count = 0;
        for (int i = 0; i < A.length; i++) {
            if (A[i] == 0) {
                countOfZero++;
            }
            if (A[i] == 1) {
                count += countOfZero;
            }
            if (count > 1000000000) {
                return -1;
            }
        }
        return count;
    }
}
```

Fig. 4. Practical work result – 1

Fig. 5. Practical work result – 2
Conclusion. Now more than 3 billion devices are running in Java in the world. To using Java language we can prepare Android, IOS, Desktop devices. Nowadays Android phone is going to increase because of low cost and support a lot of devices that’s why Java will be always in the top 3 positions. Java is more organized than other programming languages. Most of the information technology companies are choosing Java to make a big application because it’s a structured language that’s why you can easily understand what is going on and what sort of technique you should use to make a batter software and you can understand the flow and you can easily complete your task properly. Through Java, we are developing software for a different device which helps us to make our life more flexible and all the devices are user-friendly that’s why anyone can use without any problem though they don’t have any information technology knowledge. Tha11t is why we can concern about Java to develop software and create something more interesting for people. The number of devices created by Java will be increased day by day because of this language competency. And one more thing this language is like C and C++ that is why for C and C++ developer it’s also understandable and easy that’s why they can develop their software to use Java language. When we are developing programs with Java it can be more comfortable because we can easily understand what is going on and we can allocate the memory with variable according to different needs, define a variable data type, et. That is why we can say that to learn proper programming language from all perspectives Java can be the best choice.

We solved one problem using Java programming language the class name is Passing Cars. From this solution, you will get an idea about Java programming structure and coding system. It will help us to find out the busiest route and provide this information to the traffic controllers system then they can more concern about this route.

Abbreviations:

| Acronym | Description |
|---------|-------------|
| JDK     | Java Development Kit |
| OOP     | Object-Oriented Programming |
| JVM     | Java Virtual Machine |
| IDEA    | Integrated development environment. |
| IoC     | Inversion of Control |
| MVC     | Model-View-Controller |
| DAO     | Data Access Object |
| JDBC    | Java Database Connectivity |
| POJOs   | Plain old Java Objects |

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THE EFFECT OF THE PROCESSING METHOD ON THE QUALITY OF CARROTS DURING STORAGE

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Electro-activated water has high energy (redox potential value from minus 800 to plus 1,200 mV), which makes it possible to use it in the food industry for the following purposes: an increase in the storage life of raw materials at raw materials sites, alkaline cleaning of vegetables; an influence on enzyme activity; storage of vegetables in salt solutions. Therefore, vegetables with used further to obtain juices are rinsed with electro-activated water, which has a bactericidal action, to prevent propagation of aerobic and anaerobic microorganisms [1-3]. In canneries for washing vegetable raw materials (root crops), drinking chlorinated water (with a chlorine content of 0.05...0.1 mg / dm³) is used. Prolonged exposure of fresh materials at the temperature of 20...25 °C under the action of pulsing pressure can promote development of microorganisms. Therefore, additional processing of fruits to reduce microbiological contamination is necessary.

The aim of this study is to determine the influence of carrot treatment on electro-activated water (EAW) during storage. We took “Carotel” carrot variety as an object for the study. The anolyte and catholyte had the following characteristics: anolyte: pH 3.5-4, a redox potential (RP) +980...+1,100 mV, a content of active chlorine 110...130 mg/dm³; catholyte: pH 10-10.4, RP -750...-800 mV. We obtained electro-activated water at a laboratory installation with graphite electrodes from drinking water. It had the following characteristics: pH 7.5, Ca2+ - 2.8 mg-eq/dm³, Mg2+ - 98 mg-eq/dm³, HCO-3 - 3.8 mg-eq/dm³, Cl- - 150 mg/dm³. We measured pH and RP with I 130 ionometer. We stored carrots at a temperature of +1...+3 °C in open plastic bags with a film thickness of 30 gm and a moisture content of 92..95 % in a refrigerator.