GNG 2101 - Introduction to Product Development and Management for Engineers and Computer Scientists

University of Ottawa
Faculty of Engineering

Project Deliverable J

Road to Code: User Manual

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Submitted on: Sunday, July 19, 2020

Abstract

The following document outlines the key details from the product development process of Road to Code, an online Java programming workshop. The manual will summarize its important features, and explain its function and capabilities. Furthermore, documentation of the prototyping process will be presented, health and safety guidelines will be addressed, and a troubleshooting section will be included with technical instructions. Finally, the document will contain the design files, as well as some final remarks and recommendations for future work.

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Introduction

In light of the COVID-19 pandemic, the University of Ottawa has been forced to adapt its teaching methods. For the faculty of engineering, these unique circumstances have prevented the Centre for Entrepreneurship and Engineering Design (CEED) from being able to offer their in-person workshops. To solve this problem, we created Road to Code: an online, interactive workshop to teach users the basics of Java programming, easily accessible from home.

The Road to Code beginner Java programming workshop is a 90-minute interactive workshop that meets the same learning outcomes as the in-person workshops previously offered by CEED. The workshop is accessible to all University of Ottawa students and external members of the community, free of charge. The product itself is a website, where all of the workshop content can be found, including video tutorials to teach Java concepts, and a mini-game to accompany each video, allowing users to test the knowledge that they acquired. So, there are six modules included in the workshop; each one consists of one video tutorial, and one level in the game. The module is considered complete when the respective level of the game is finished.

The workshop's game component serves two very important purposes. First, it allows for a more entertaining style of learning, as it is fun and interactive for the user. Second, it is the way that users can evaluate themselves, to ensure that the Java concepts taught in the video tutorial were understood correctly. More importantly, the game makes our product stand out from most online learning platforms already on the market. As a team, it was essential that we avoided creating a mundane workshop with a basic quiz that would likely bore the user, making it very difficult to learn. Without our product, it would be very difficult for the university to teach their Java workshops at a distance. There are other alternatives that could be used to educate their students, however, our workshop is the most entertaining, with the incorporation of the game, and the simplest to navigate with our very clean and organized user interface. Our team has thus made learning Java fun, easy, and accessible for anyone. Our online workshop is a necessary tool for the university to use as a replacement to their workshops during this pandemic, and will also be great to use when the university decides to resume regular academic procedures.

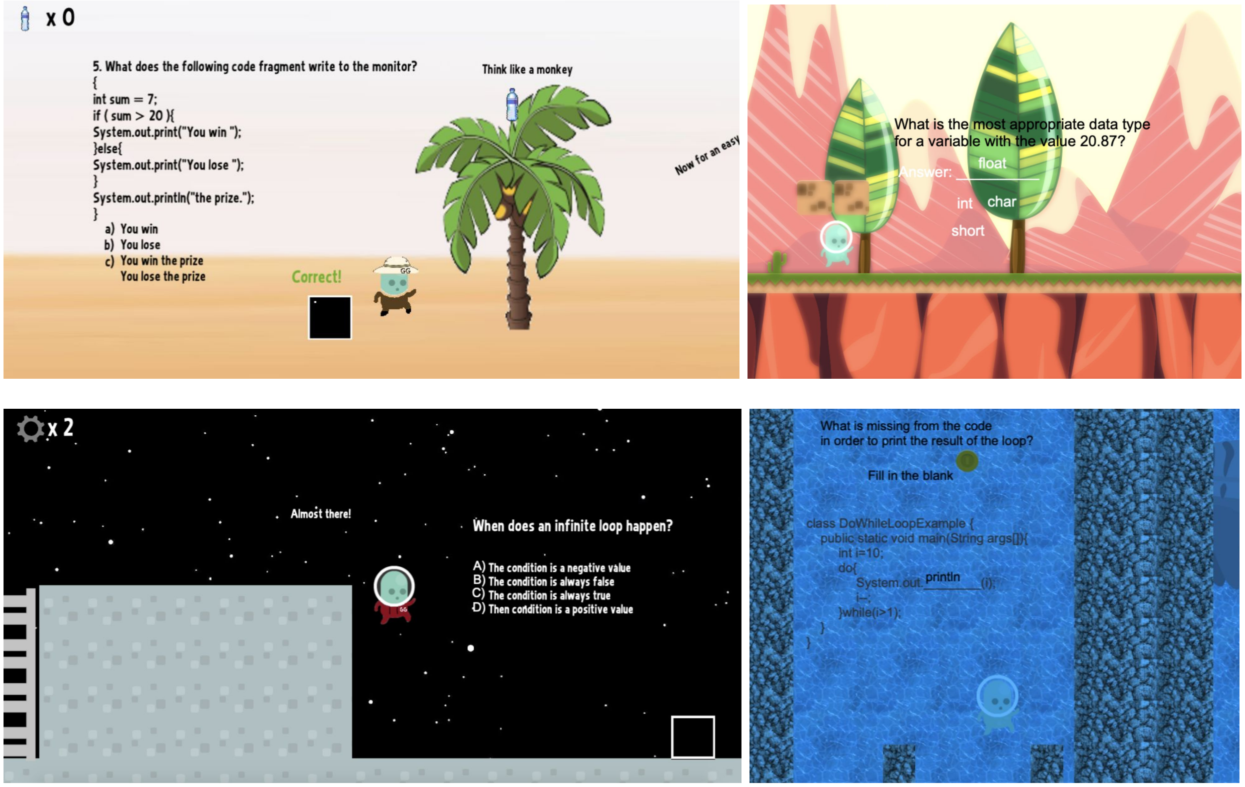
User Manual

Features, Functions, and Capabilities

There are three core features of the Road to Code basic Java workshop:

- Video tutorials
- A 2D platformer game
- A live messaging feature

The three components work together to give the user the best possible experience by serving three very important functions. First, the video tutorials are essential to teach the user the specific Java concept of the module they are learning. Next, the game allows the user to test the knowledge they have learned by providing them with quiz questions relating to the Java concepts taught in the video. These questions must be answered correctly in order to successfully complete the level of the game. Moreover, the game functions as a way to keep the user engaged. There are six games, which are to be completed after each of the six corresponding video tutorials, which allows the learning portion of the workshop to be broken up for the user, giving them the chance to focus on each short video without losing their focus. The different themes for the games in each module keep each level new and interesting for the user as well. Figure 1.0 illustrates some of the themes used in the game for various modules.



5. What does the following code fragment write to the monitor?

```
{
int sum = 7;
if ( sum > 20 ){
System.out.print("You win ");
}else{
System.out.print("You lose ");
}
System.out.println("the prize.");
}
```

a) You win
b) You lose
c) You win the prize
You lose the prize

What is the most appropriate data type for a variable with the value 20.87?

Answer: ________

float
int char
short

When does an infinite loop happen?

A) The condition is a negative value
B) The condition is always false
C) The condition is always true
D) Then condition is a positive value

What is missing from the code
in order to print the result of the loop?

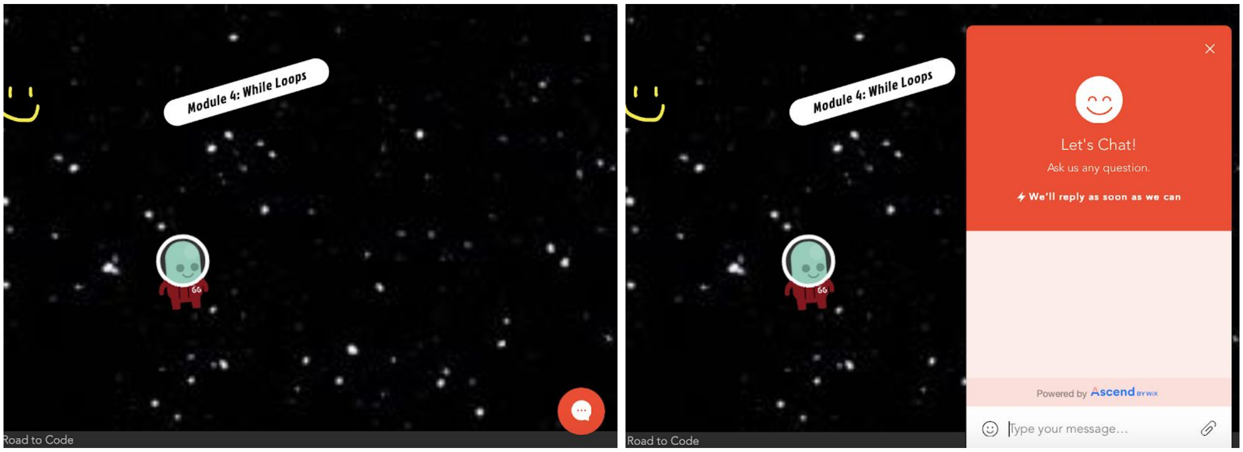
Fill in the blank

```
class DoWhileLoopExample {
   public static void main(String args[]){
        int i=10;
        do{
             System.out.__println___(i);
             i--;
        }while(i>1);
   }
}
```

Figure 1.0 - Game Theme Examples

<u>Prototype Construction</u>

The Road to Code product was created using WIX.com, an online website building platform. We customized the layout of the website and opted for a space theme to complement the game component of the product. The video tutorials included in each of the six modules are linked from YouTube and were not created by our team. These videos serve as placeholders for the video content that CEED will produce. When CEED produces their own tutorial videos, each an average of 10 minutes, they can be inserted where the current YouTube videos are found on the website. The game portion was created using the software called GDevelop, an open-source game creator that doesn't require any programming, making it relatively straight-forward to learn. The live chat feature was easily added to the website using one of the customizable built-in features available on WIX.com. Figure 2.0, shows how a small, sleek chat icon can actually be a very powerful tool for users of the site. By being signed in to the WIX account used to develop the website, instructors will be able to see any users' questions come in, and then reply to them promptly.



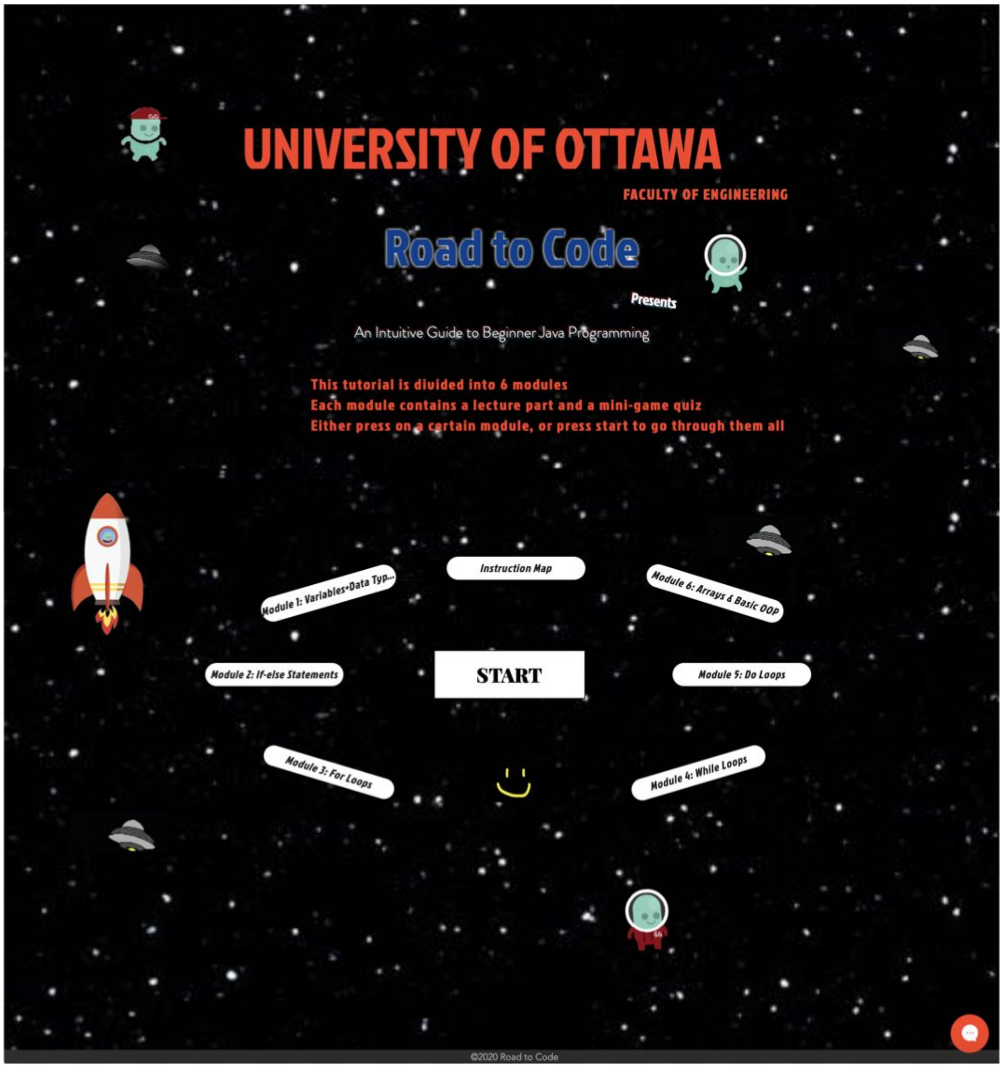
Let's Chat!
Ask us any question.
We'll reply as soon as we can

Figure 2.0 - Live Chat Feature

In terms of maintaining or updating the website or the games included on the website, this can be done through the accounts that our team used to create the product. For access, any of the team members can be contacted.

Product Use

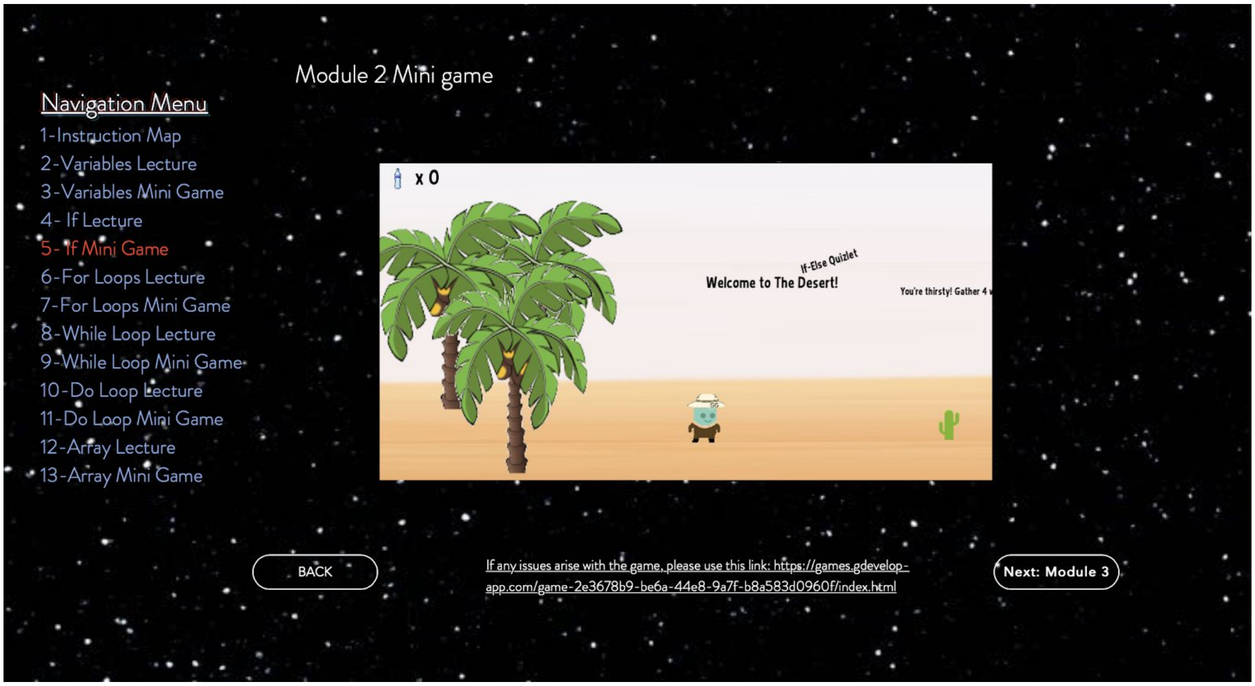
Road to Code is extremely easy and intuitive to use, and accessible to anyone with a computer or laptop, and an internet connection. By using the website link, https://mjark066.wixsite.com/uottawa, the user will be taken directly to the home page. The home page will welcome them to the workshop and instruct them on how to navigate through the different modules. Essentially the user can scroll to the "Start" button, which will take them through the six modules in the recommended order. The user also has the ability to click on a specific module to jump to a specific topic, which can be helpful if they are revisiting the website, or if they are not a complete beginner to Java programming and want to skip some concepts that they are already familiar with. Figure 3.0 shows a screenshot of the website's homepage where the instructions mentioned are included, as well as the buttons to start the workshop at any of the six modules. If the user clicks on the "Start" button, they will go through an instruction map first. This is a mini game that teaches the user how to move around in the game environment, and how to answer the questions. Then, when ready, they will move on to the first module where they will watch a video tutorial. When they have understood the tutorial, they will complete the module by completing the game for that module, which contains quiz questions related to the video they have just watched. The user will continue this process until all six modules are complete; this should take approximately 80-90 minutes, which is the length of a typical in-person workshop offered by CEED. The live chat function can be used by simply clicking the chat icon in the lower right corner of the home page. Users can type in their questions and a workshop instructor will be able to give them the answers they need.



This tutorial is divided into 6 modules
Each module contains a lecture part and a mini-game quiz
Either press on a certain module, or press start to go through them all

Figure 3.0 - Website Home Page

Figure 3.1 illustrates how the workshop can be followed once the user selects a module or clicks on the "Start" button. There are buttons below the video tutorials and games allowing the user to navigate to the next (or previous) module as well as a navigation menu on the side for easy access to any of the video tutorials or games from any of the six modules.



If any issues arise with the game, please use this link: https://games.gdevelop-app.com/game-2e3678b9-be6a-44e8-9a7f-b8a583d0960f/index.html

Figure 3.1 - Navigating the Workshop Modules

Health and Safety Guidelines

The only factors related to health and safety that should be considered before using our product is the user's potential eye strain caused by looking at a computer screen for a long period of time, or the possibility of headphones causing damage to their ears if the volume is too high. Users should be aware of the potential short-term effects of staring at a screen for a long period of time. Users' tolerance levels will undoubtedly vary, however, the American Optometric Association suggests that computer vision syndrome (or digital eye strain) could cause headaches, blurred vision, dry eyes, and even neck and shoulder pain. They suggest that to prevent these symptoms, the 20-20-20 rule should be applied. This rule consists of taking a 20-second break every 20 minutes to stare at an object about 20 feet away. Additionally, users should take care to set the volume on their computer, laptop, or headphones to an appropriate level to prevent hearing damage. Once again, different users will have different tolerances, but the sound should be loud enough for the user to hear, and no louder. According to Leslie Young's article on headphone use, professor of audiology, Bill Hodgetts, recommends using noise-cancelling headphones, rather than typical headphones or earbuds, to avoid the temptation to raise the volume when there is external noise in one's environment. However, if possible, using the speakers on the user's computer would be suggested to minimize the risk of hearing damage as much as possible. Of course, it should be noted that our 90-minute workshop does not pose any significant health threats even to the user's eyes or ears. Nonetheless, these factors should be mentioned.

Troubleshooting

Potential problems could include…

The game cannot be played (i.e. the character is stuck and cannot move, or questions cannot be answered)

- Ensure that the correct keys are being used, by using the instruction map
  - Arrow keys can be used to move around
  - Space bar can be used to jump
  - Questions can be answered by dragging the letter of an answer into the terminal (black rectangular box)
- Click the link below the game window if issue is not solved

The webpage text, video tutorial, or game window is too small to view

- Use the 'Command' and the '+' keys on a Mac, or the 'Control' and the '+' keys on a PC to increase the website's font size
- Press the 'f' key or click the bottom right button on the video to view the tutorial in full screen
- Click on the link below the game window to open the game in full screen

The game sounds are distracting

- The game's sound effects can be turned off using your keyboard's mute buttons

The video tutorial didn’t answer a user’s question or explain a concept clearly enough for them

- Use the live chat feature to ask specific questions to a workshop instructor

Any other issues can also be addressed by contacting a workshop instructor using the live chat feature to resolve any Java-related issues, or issues navigating the website and completing the workshop.

Design Files

The following are links to the games for each individual module, in addition to the instruction map.

Instruction map:
https://games.gdevelop-app.com/game-e6caa159-48b9-484e-9796-9e5f0a0337f7/index.html
Module 1: https://vibrant-northcutt-1ec975.netlify.app
Module 2:
https://games.gdevelop-app.com/game-2e3678b9-be6a-44e8-9a7f-b8a583d0960f/index.html
Module 3: https://vibrant-khorana-a9deed.netlify.app
Module 4:
https://games.gdevelop-app.com/game-0f45bccf-1fc9-40c5-be10-7d3185149676/index.html
Module 5: https://gracious-gates-4e52b6.netlify.app
Module 6: https://nostalgic-stonebraker-1e6fe9.netlify.app

The following is a link to a public drive containing seven folders which include the images used to create the games on GDevelop:
https://drive.google.com/drive/folders/1yTd-ro9JCoK-46VtZQzTWHvpp-Sl0BOr?fbclid=IwAR0rc7_fuqy28SqMDxoXJPQWBgIUnGuWvE2VYAZOru5xMUK5B55jiIb_k30

The following is a link to the website created on WIX.com:
https://mjark066.wixsite.com/uottawa

Conclusions and Recommendations for Future Work

Throughout the course of the product development process, we learned many lessons. First, we were able to fully understand the importance of regular client meetings: our client provided us with a lot of valuable feedback along the way, and constant communication allowed us to ensure that our focus was always on solving the right problem. Moreover, we learned important soft skills including teamwork, communication, and problem solving. Going through the different stages of team formation, including the forming, storming, norming, and performing phases, we were able to build a good team relationship and discover the best ways to manage any conflicts that arose. Furthermore, creating the game using the GDevelop taught us how to use this software that we had never used previously. Developing the various levels of the game and creating our website allowed us to apply our creativity, as well. Completing the entire iterative engineering design process taught us a lot, but ultimately resulted in the creation of Road to Code: the perfect solution to providing CEED with an interactive, online Java programming workshop for beginners.

In terms of our future plans, on a large-scale, if we were to commercialize our product, we would hire employees to develop hundreds of modules to be suited to programmers with different levels of experience. This would expand our basic workshop containing six simple modules, into a much more extensive workshop for programmers of all abilities. In this scenario, we would adopt a freemium business model in order to generate revenue and make a profit. The freemium business model would allow users to gain access to the workshops for free if they choose, but will also give them the option to pay $4.99 per month for access to some premium features. For example, the free version will contain ads, while the paid version will be free of ads, contain additional lessons and quizzes, and contain the live messaging feature to communicate with the workshop's instructors. It should also be noted that if we were to commercialize our product, our workshop would no longer solely be a replacement for the in-person workshops previously offered by CEED. Instead the free version would act as the in-person workshop replacement, while the paid version with hundreds of other modules would expand much further beyond what the CEED workshops used to provide, hence lasting much longer than 90 minutes if the user chooses.

However, the commercializing of our product would be a very large task to complete. So, if we keep our focus on the creation of an online workshop to be used by CEED to replace their in-person workshops while the University of Ottawa campus remains closed, our next step would be to incorporate their video tutorials into the website. Currently, the website has a place for these videos, but the actual content is simply a video found on YouTube, explaining the concepts of each of the six modules. Since CEED informed us that they would provide the content to the workshops, we would be able to replace these YouTube videos with a video tutorial created by CEED. This small change would allow the Road to Code website to be used in place of the in-person workshops that used to be offered, particularly since the videos provided by CEED would give tutorials to the users in a very similar way to the tutorials they would have been given in person.

Bibliography

“Computer Vision Syndrome.” *American Optometric Association*, www.aoa.org/patients-and-public/caring-for-your-vision/protecting-your-vision/computer-vision-syndrome.

Young, Leslie. “Constantly Using Headphones Can Cause Hearing Damage – Here's How to Prevent It.” *Global News*, Global News, 5 June 2019, globalnews.ca/news/5307570/headphones-earbuds-hearing-loss/.

Appendix

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