Programming Project 2: Control system manual

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Preperatory programme in Computer Science

Academic year 2023-2024

1   Description

The following document contains a detailed explanation on how to use the so called *Control System application*. In order to use this application one must understand what it does and what its purpose is. The control system application is an application that allows users to control a model railway (as shown in figure 1). This model railway has multiple components which are switches, barriers, lights, detection blocks, and trains. These components can freely be adjusted by the user to their desired state. For example, a user could put a train on a desired track, adjust certain switches to make a certain path possible, and then make the train ride to the desired track through this application. This document consists of 2 major parts, first we will set up the application so that the user can use it. Second, we will describe to the user how it can be used.

Figure 1: An example of a model railway.

2   Application set-up

In order to run the application the user requires a working computer with certain applications preinstalled. These applications consist of a program freely available on the internet, namely DrRacket, as well as certain packages to make everything run smoothly. First we will install DrRacket, which is an environment in which we run everything. In order to install this app the user must go to the following website: https://download.racket-lang.org and choose the right platform according to your device. Press the download button once the correct platform has been chosen, and a file will pop up in your downloads folder. When the file is finished downloading, open it. Depending on the operating system of your device, the application might be installed or additional actions are necessary. For MacOS users, the application should be ready to use. However Windows users must open the installer and follow the steps as described in the installer, as shown on figure 1.2. More specifically press the next button which opens a new window with a folder location.

Choose the desired folder location and then press next, which opens a new window, and then press install on the bottom. This will install the DrRacket application.
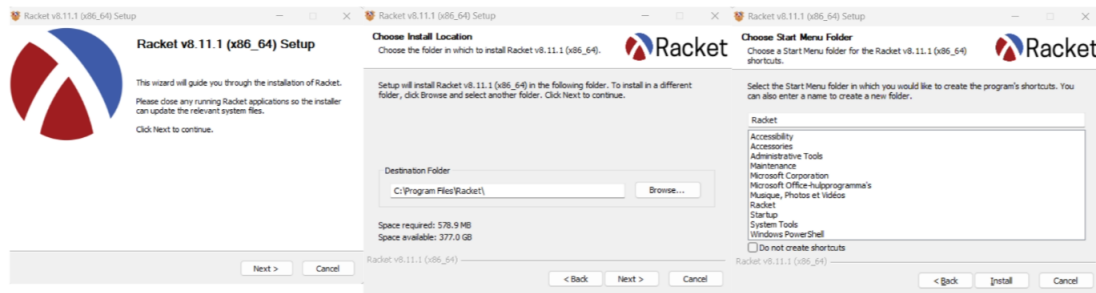

Figure 2: Steps of DrRacket installer for Windows.

Once this is done, all types of devices should be ready to run the app. In order the run the application the user must open DrRacket which will give you a window as more or less described in figure 3.
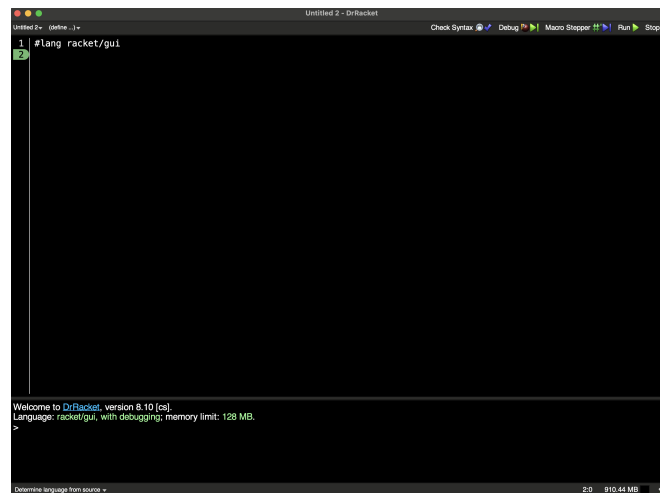

Figure 3: Window that should be seen when starting up DrRacket.

Once we have this window, we must install a certain package in order to run the control system application. More specifically, the *graph* package. In order to do that the user must open the package manager which is done by going to the menu bar of DrRacket and selecting **File** and choosing **Package manager** as seen in Figure 1.4.
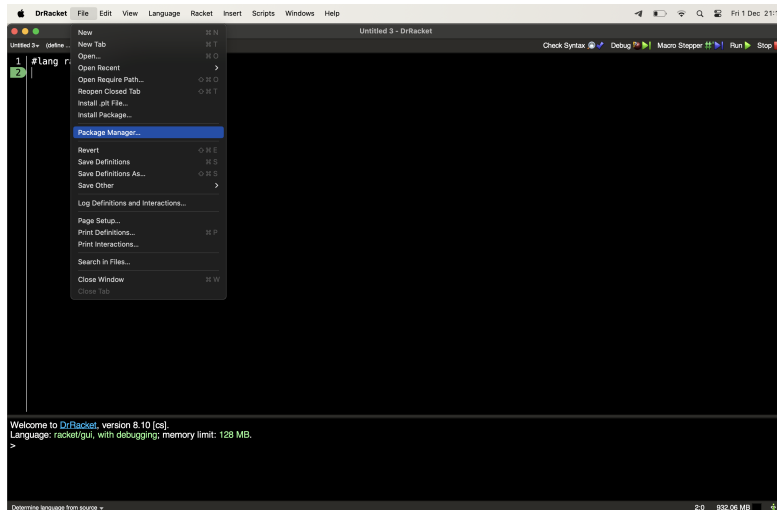
Figure 4: Opening the package manager.

When doing that the user should see the window as described in Figure 1.5. The user should now type *graph* into the package source field and press install. This package will start installing and is finished when the **Close Output** button at the bottom becomes clickable.
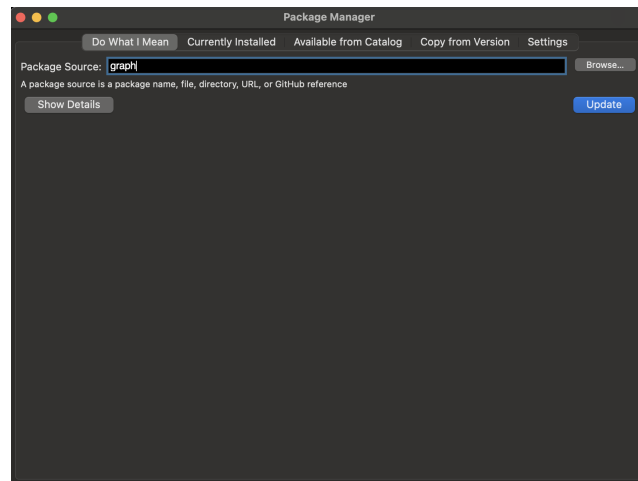

Figure 5: The package manager.

The user is now ready for the next section, describing how to use the application.

3   Application usage

Once everything has been set up as mentioned in the previous section, the user is ready to start using the control system application. In order to start the app, the user should open the *main.rkt*

file from the control system application in DrRacket and press on the *Run* button in the top right corner containing a green triangle. The window depicted in figure 6 should show up.
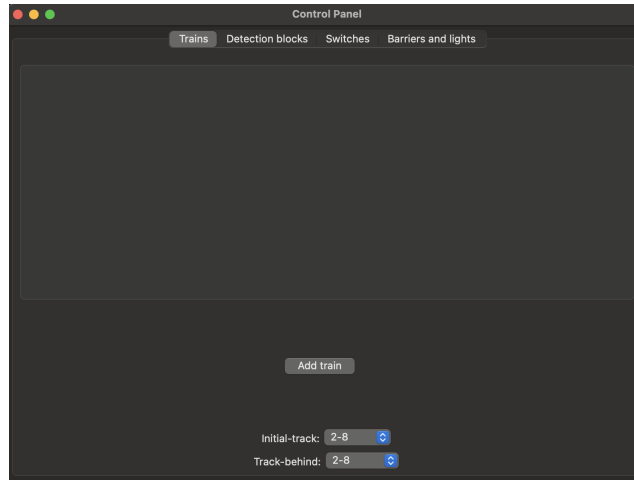

Figure 6: First window upon opening.

The window shown is the initial window, and is the window which allows the users to add trains to the track. In order to understand how to add trains one must understand the specific track we are working with, with their components. This is visualized in figure 7.
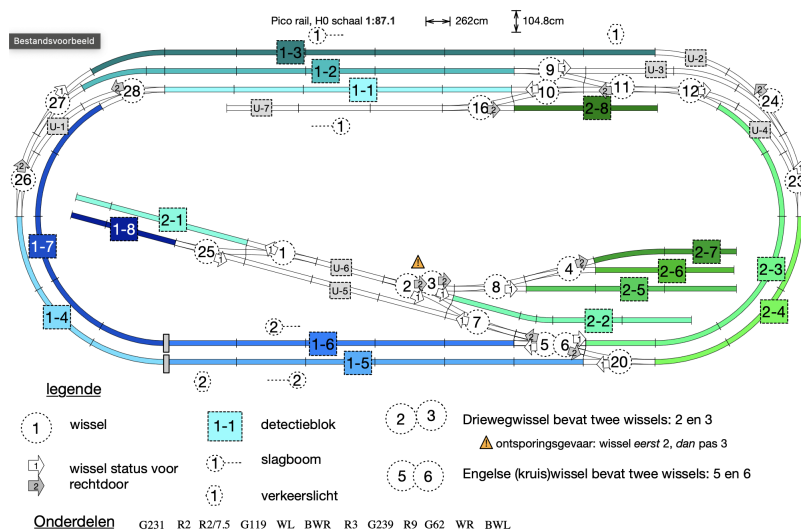

Figure 7: The track used.

In order to add a train to the tracks, the user must choose the track on which he wants to put the train given by *Initial track* and choose the track behind the initial track, given by *Track behind*.

When the train is made, it will be put on the *Initial track* and move away from the *Track behind* when the speed is positively increased. To finalize adding the train, the user must press the add train button which will give the window as depicted in figure 8.
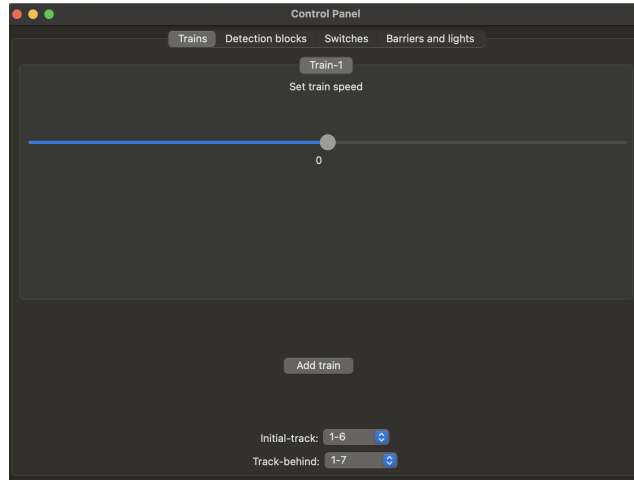

Figure 8: The train window with the trains and their speed.

By adjusting the slider, the user can now change the speed of the train. Moreover, the user can also see which tracks contain trains and which do not, by pressing on the *Detection blocks* tab next to the *Trains* tab as seen in figure 9.
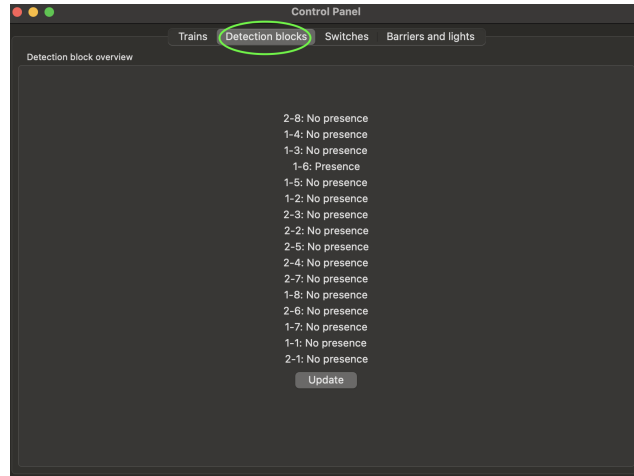

Figure 9: The detection block tab.

During the application's runtime, the user should press update in order to see the presence of trains on the different tracks. Furthermore, the user can also change and get the state of the switches by going over to the *Switch* tab. This tab is visualized in figure 10.
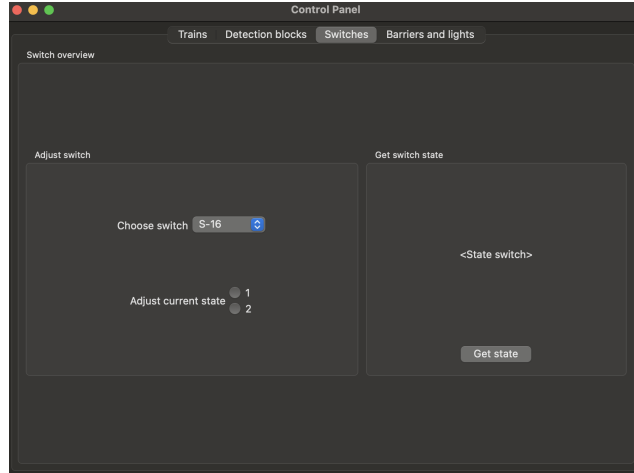
Figure 10: The switch tab.

In order to change the state of a switch, the user has to choose the switch and then press the state they would like the switch to be in, which is either 1 or 2. If one would like to get the state of a particular switch, one has to choose the right switch and then press the *get state* button which will show the current state of the switch. At last, when moving over to the *barriers and lights* tab, as depicted in figure 11, the user can change the state of barriers and lights. For the barriers this is done by pressing the state in which the user would like the barrier to be in. For the lights this is done by selecting the state the user would like the lights to be in. More information on the different states of the lights can be found in the appendix.
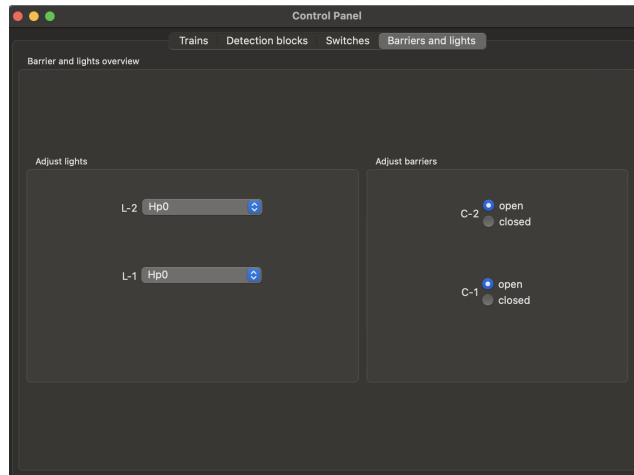

Figure 11: The barriers and lights tab.

4 Conclusion

To finalize, reading this document the user is now able to play around with the application and the railway. However it is important for the user to know, that certain features have not yet been made fool proof, such as trains leaving the railway or colliding against each other. We encourage users' to be safe in using the application, features will be developed to avoid this in the near future.

5 Appendix

The different light states and their meaning are depicted in the following figures.

Figure 12: Hp0 meaning trains are prohibitted from passing through.

Figure 13: Hp1 meaning trains are allowing to pass through.

Figure 14: Hp0+Sh0 meaning trains are not allowed to perform maneuvers.

Figure 15: Ks1+Zs3 meaning trains are allowed to pass through but at limited speed given by the number 8.

Figure 16: Ks2 meaning trains are allowed to slow down but must eventually stop.

Figure 17: Ks2+Zs3 meaning trains are allowed to slow down but must stop eventually. A limited speed is depicted by the number 8.

Figure 18: Sh1 meaning trains are allowed to perform maneuvers.

Figure 19: Ks1+Zs3+Zs3v meaning trains are allowed to ride at a slower speed. The number 8 depicts the current max speed while the number 6 depicts the max speed later on the track.