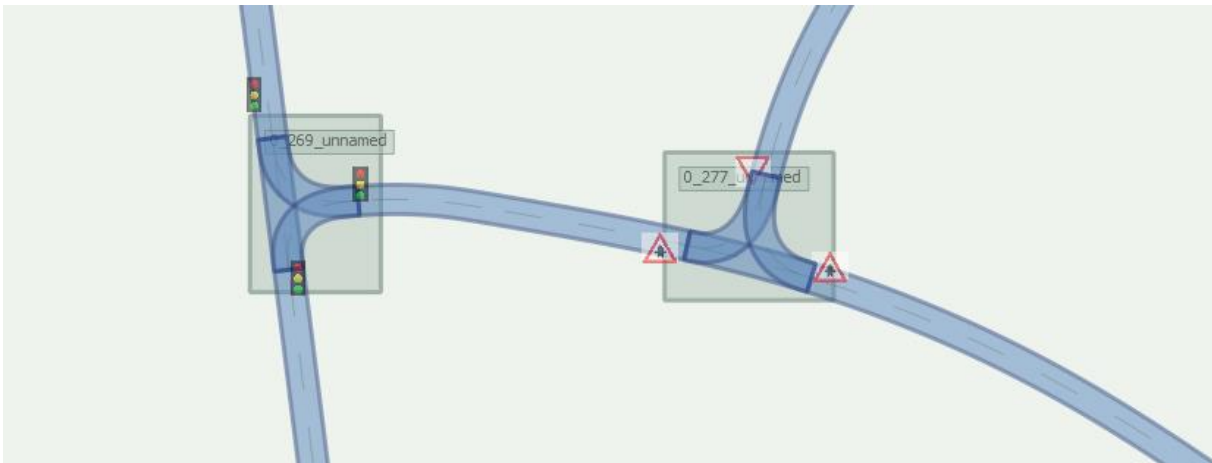
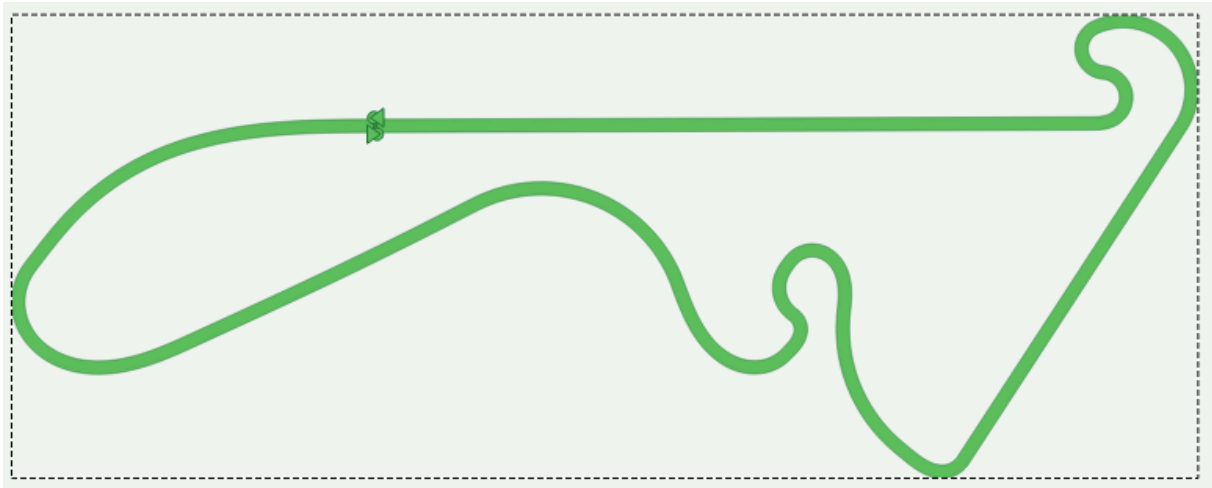


# Oddlot basic Manual

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## Introduction

The goal of this basic manual is, to give a new user the opportunity to create a functional road map within Oddlot. Moreover the produced road map is intended to be used in a driving simulation. This manual does not cover all functions and it is assumed that a user has already acquired basic software knowledge.

Oddlot has been developed by the HLRS and is an opensource software, which can be downloaded on their website.

*“Current research in the field of autonomous driving, the development of advanced driver assistance systems (ADAS), and new regulations for the safety of autonomous features require extensive testing in virtual environments and simulators. Roads, signals and road objects for driving simulators have to be modelled as close to reality as possible. A lot of time is necessary to collect data and model the road network, the landscape, vegetation as well as road signs and traffic lights. A standard file format has the advantage of easy exchange between different simulation environments, applications and companies. OpenDRIVE® is a standard to describe road networks, including maps, objects, surface properties and signaling. Particular specifications for certain driving simulators can be added via user defined tags.*

*To ease the creation of virtual driving simulator tracks the HLRS is developing an OpenDRIVE® Editor. The so called ODDLOT is part of COVISE, the Collaborative Visualization and Simulation Environment, an Open Source package (LGPL2+) available on GitHub. ODDLOT is adapting to the on going extensions of the OpenDRIVE® standard, making it possible to describe dynamically changing elements in the future.*

*In ODDLOT the user can load maps and draw roads in a 2-dimensional graphical interface using different prototypes, specified by the number of lanes, their width and road markings. Roads can be linked together, allowing to manipulate the driving decisions of autonomous intelligent vehicles in the scene. Junctions can be created automatically by defining the area of intersection or manually in a specialized editor. ODDLOT comes with a bundle of common German signals as well as Chinese signals to make the placement of signs easy. Different kinds of barriers are available too, but new objects can also be described in an XML file. Tiles can be connected to build large networks, thereby reducing the modelling time by reusing already existing tiles.”*

- Description by the HLRS

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## 1. Basics

For your understanding:

- A project is a road map that you created or loaded into Oddlot.
- Commands that you can click will be marked like this “**possible to click**”

- *Think of everything you create as a picture, the way it looks on your screen it will look like to your simulation software! Oddlot does not give any traffic rules along, only the picture you paint. The simulation software is responsible for the interpretation of roadmarks and signs!*

A couple of things in advance:

- Save your project about every 15 minutes. Oddlot might crash randomly
- To avoid crashes never use the “Entf”(german)/ “Delete”(english) key
- To avoid crashes do not use “Strg”(german)/ “Ctrl”(english) key to multiselect
- As of now (16.02.2018) a click on the Menu Tab “**OpenScenario**” will terminate Oddlot. Based on the version downloaded from the HLRS website.
- You can undo actions using “**Strg+z**”/ “**Ctrl+z**”
- You can redo actions using “**Strg+y**”/ “**Ctrl+y**”
- In the right bottom corner there is a tab named “**Undo History**”, it lists your undo actions.
- RMB= right-mouse-button/ LMB= left-mouse-button

## 1.1 View Handling

To navigate around your project you can use:

- Arrow keys to move left/ right/ up & down
- Mouse wheel to zoom in & out. It will zoom depending on where your cursor is.
- with RMB onto a track/ junction/ lane you can delete or hide it

Furthermore there is a toolbar you can use, its functions are self-explanatory. It is right above the Menu Tabs. (reference in Figure 1)

## 1.2 Miscellaneous

Oddlot has does not control or correct your design and actions. Make sure your project meets the requirements for your simulation software, especially the logical connections of your roads and lanes.

The following site shows Oddlot right after you started it on your computer.

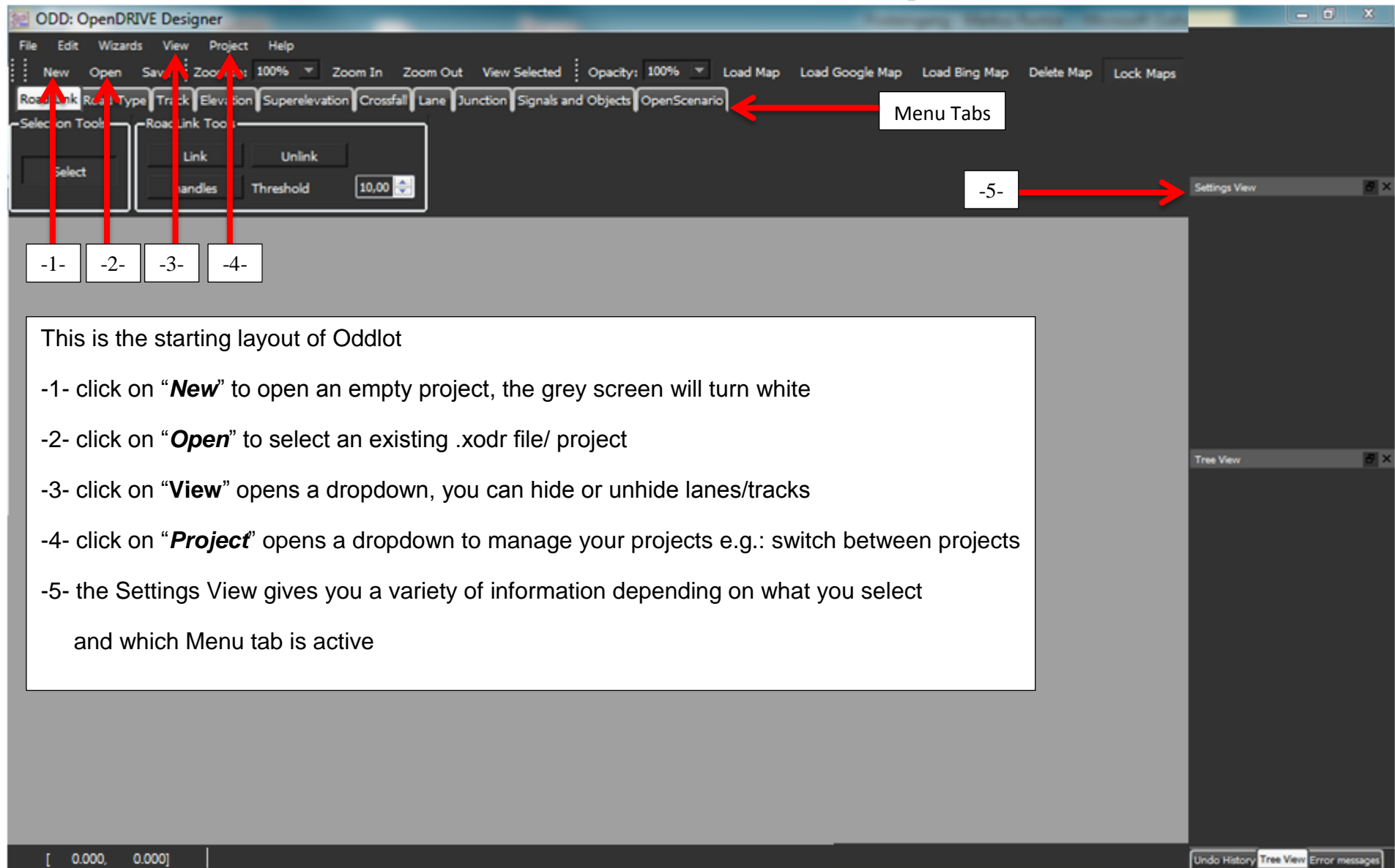


Figure 1.1: Oddlot starting window

## 2. Menu Tabs

The following chapter describes the Menu Tabs and how to use the functions within. For a step by step tutorial to create a project go to chapter 3.

### 2.1 Road Link

A road link represents the connection between two roads that are connected through a junction. It simply tells the simulation that there is a transition. If the road link is not correct, a simulated car might drive into the wrong direction of traffic. Therefore it is important that your roads are linked correct.

If the “**Road Link**” menu tab is active your track has a circle and a triangle at its end (Figure 2.1). If the track is linked, there will be a line between opposite circle and triangle in addition they are connected with a thin grey line as shown in Figure 2.2. The grey line indicates which track parts are connected. You will always have to check that only the lanes that you want to be linked are connected. Figure 2.3 shows a wrong example. You can see some diagonal links, which do not make sense. Links are only sensible if the roads/ lanes are touch so that there is no gap between them. Note if either circle or triangle is red, something is wrong too. If a road/ lane is yellow, then there is an unlinked end existing. If the road/ lane is green all ends are linked at least once (see Figures 2.1-2.3).

In order to correct the wrong links in Figure 2.3 follow these steps.

Step 1: Click the “Junction” menu tab and select the correspondent junction. On the right hand side, under “Settings view”, you can see start and end contacts, their number has to be equal! Scroll down in the

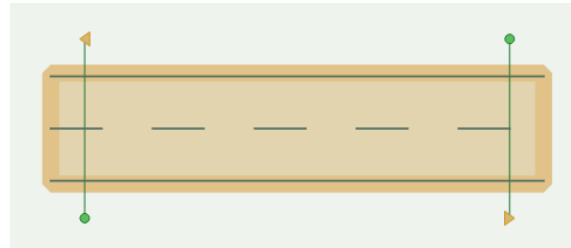


Figure 2.1: Trackpart as shown in „Road Link“

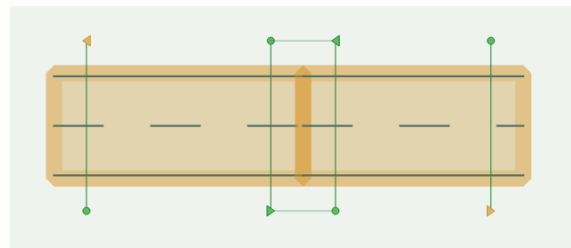


Figure 2.2: Two linked track parts

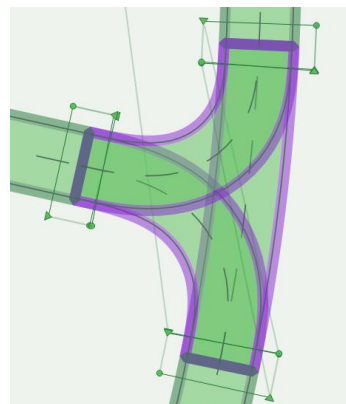


Figure 2.3: Wrong road links

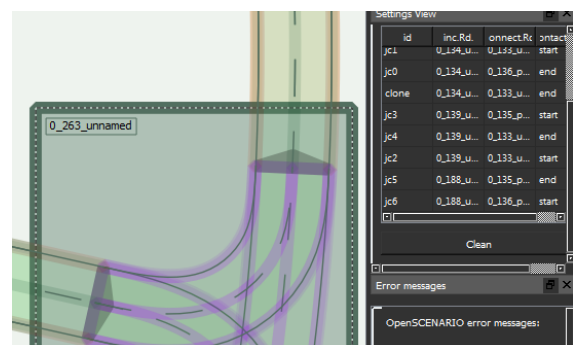


Figure 2.4: Step 1 links to be cleaned in junction

window and click "**Clean**" (see Figure 2.4). To update you have to click anywhere in the screen and reselect the junction. The former filled table should be empty.

Step 2: Select the "**Road Link**" menu tab and select "**Select**" in the left hand upper corner under "Selection Tools". You might still see some wrong gray lines. Now click LMB next to your junction and hold LMB, drag the cursor over the junction and cover all roads/ lanes that you want to link. Then click "Unlink" in the right upper corner under "RoadLink Tools". All road parts should now be yellow (see Figure 2.5)

Step 3: Now select "**Select**" again repeat the selection as mentioned before and click "**Link**". Note you might have to switch between "**Select**" and "**Link**" once or twice to be able to drag the blue selection rectangle again. Control your number of start and end connections and the gray lines. It should look like Figure 2.6. In this case there should be three start and three end points. In a junction with four roads it should be six each.

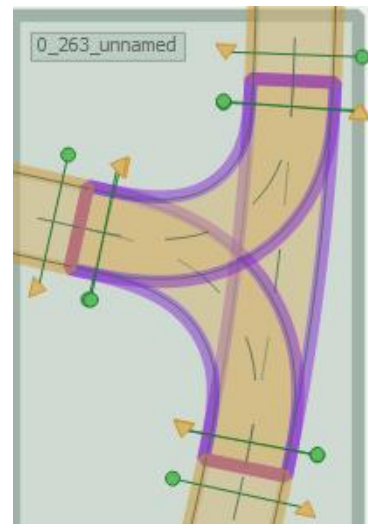


Figure 2.5: Step 2 after „Unlink“

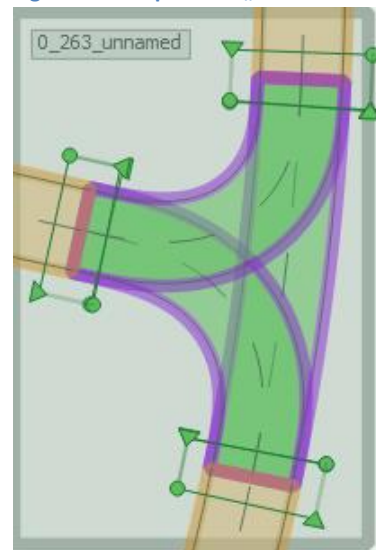


Figure 2.6: Step 3 links after successful linking

## 2.3 Track

### 2.3.1 Road Tools

This Menu Tab contains commands to create roads. With a LMB click on "**New**", you can create a straight road with two lanes in each direction. In order to create a new road map you need to start with "**New**". Simply click and hold LMB and drag it along the screen, a green bar/road will appear, as long as you hold LMB you can change length and orientation. Within the "Settings View" you can change the length via entering the magnitude (see Figure 2.7).

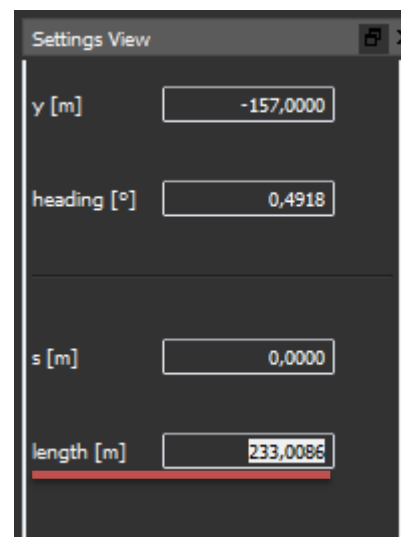


Figure 2.7: Changing length in Settings View



With LMB on **“Delete”** you activate the delete function. If you hit a road with LMB you will delete it.

With a LMB on **“Merge”** you can connect to straight parts that are not in line to a certain degree. To merge hit a road part with LMB click on of the roads (it will light up in green) and then LMB the next road. The road in the left will stay in its place, no matter which one you click first. Be careful of the gaps that might cause problems in the simulation. After merging the road parts are one part, there a now links between them, it is considered as one straight line.

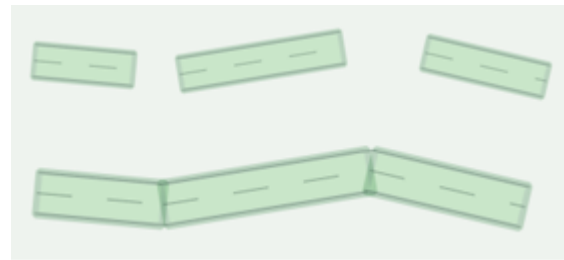


Figure 2.8: Road parts before & after „Merge“

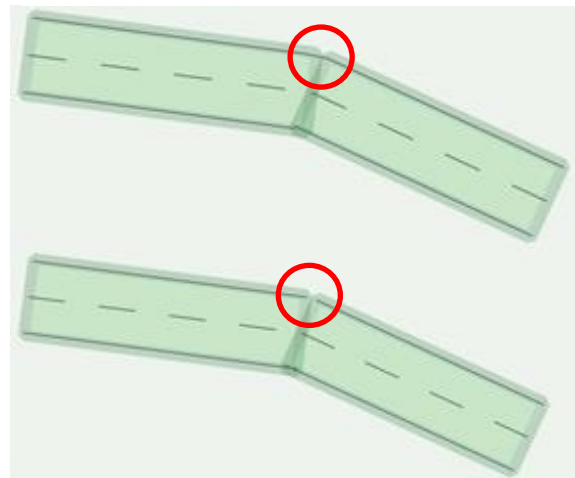


Figure 2.9: Road before & after „Split“

With LMB on **“Split”** you can break up merged road parts. They are now to connected parts, be careful with the gaps. The road links still exists, but the street marking has now gaps (see Figure 2.9).

With LMB on **“Snap to”** you can connect a curve end to a straight part. If it is possible to create a symmetric curve it will work otherwise it will connect but leave a gap. The straight part will stay in its place, while the curve will adjust. Simply LMB on your curve and then onto the straight part. Note: The **“Road Links”** might be false!

With LMB on **“Cut”** you can cut straight roads into parts. You can now move the parts individually. Careful you’ll also create a correct **“Road Link”**. Simply click anywhere on the road a black cursor will appear to show where the cut is made.

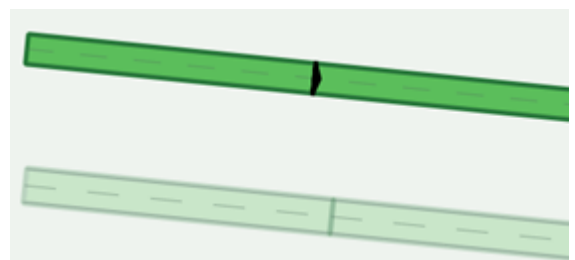


Figure 2.10: Road before & after „Cut“

With LMB on **“Select/Modify”** you can move road parts or change their orientation. As in figure 2.11 LMB the circle for orientation and LMB the rectangle to move. If either of them is yellow you will also change e.g. the curve connected to it. If either circle or rectangle is red you cannot change anything.

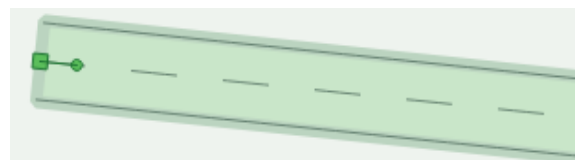


Figure 2.11: “Select/Modify” a road part

With LMB on **“Add Prototype”** you can add a junction with three roads as in figure 2.12. Click LMB anywhere in the screen, if you hold LMB you can change the orientation as well. Since the Road Links are wrong and the linking process does not work correctly it's not recommended to use this function.

### 2.3.2 Track Tools

With LMB on **“Curve”** you can add a curve upon a straight road part. Green triangles will appear on either side of the road part, LMB onto a triangle and then onto the screen will create your curve (see figure 2.12). You're able to continue curve after curve. Curve and straight part are considered as one. Note: It needs to be symmetrical otherwise it will not create anything.

With LMB on **“Line”** and LMB onto the triangle of a curve or straight part you can add a straight line to your road that has the same orientation (see figure 2.13).

With LMB on **“Split”** you can split curves. But it does not allow you to modify anything. You can use it to delete one or more of the three parts a curve exists out of.

With LMB on **“Delete”** you activate the same function as in Road Tools.

With LMB on **“Modify”** you're able to change the curvature, length and orientation of your curve. Click LMB, hold and drag it along. Usable are circles and rectangles as long as there not red (see figure 2.14).

The **“Add Prototype”** function adds a curve which has always the same length and the same curvature. Click LMB on the green triangle at the end of the road part and the second click LMB anywhere on the screen.

With LMB on **“Circle”** you can create a closed circle with two lanes. Click LMB anywhere in the screen, hold and drag it along. The middle of the circle will be the point where you click LMB. On the bottom left of your screen it will say “Length”, that represents the radius. Be sure of the size of your circle you can't adjust it afterwards!

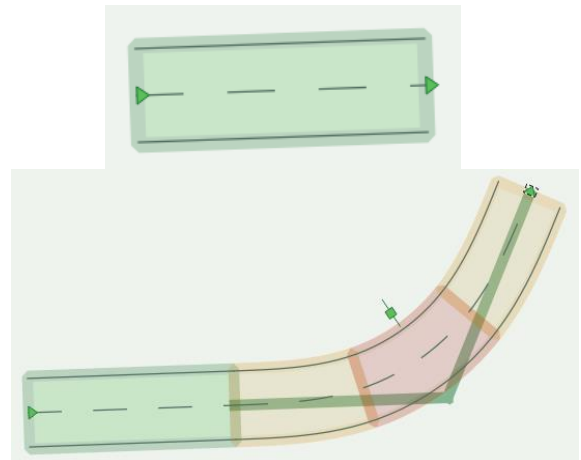


Figure 2.12: Creating a curve

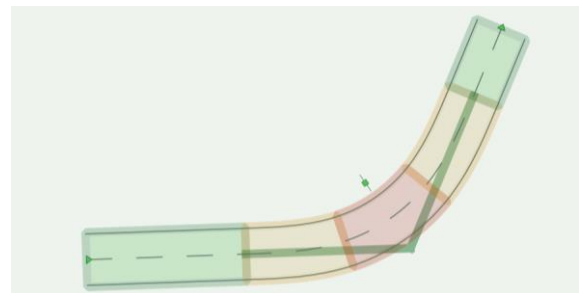


Figure 2.13: Adding a line

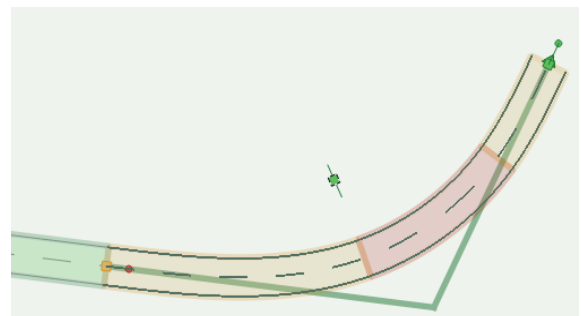


Figure 2.14: Modification of a curve

## 2.4 Elevation

Within this menu tab you can modify the elevation of the track. If the elevation menu tab is activated the road will appear in blue. As soon as the road has any elevation it will appear in green. To avoid edges there is a smooth tool. If a road part is smooth for a transition it will appear in yellow. You are able to multiselect parts.

If you click onto your track a bottom window will open. The road parts are marked with green rectangles. You can change the height by LMB and hold the rectangle and then pull it up or down. Far more precise is entering the magnitude into the “Height” window under the menu tab bar. In Figure 2.15 you can see different heights on a road part. To create a new height point, click LMB “**New**” and then click LMB anywhere on your road. At the point you select the elevation will reach its maximum. You’re also able with LMB “**Delete**” to delete those points.

In order to smooth the roads click on a green rectangle in the bottom window. Select “**smooth**” if it does not work look at the error message below. You might have to change your “Smooth Radius” (see figure 2.16).

Note: If you create elevation differences make sure there are no cliffs. This is important for “Superelevation” and “Crossfall” as well (see figure 2.17).

## 2.5 Superelevation

Creating a superelevation works equally to elevation. There is only no possibility to enter an exact magnitude.

## 2.6 Crossfall

Creating a crossfall works equally to elevation. There is only no possibility to enter an exact magnitude.

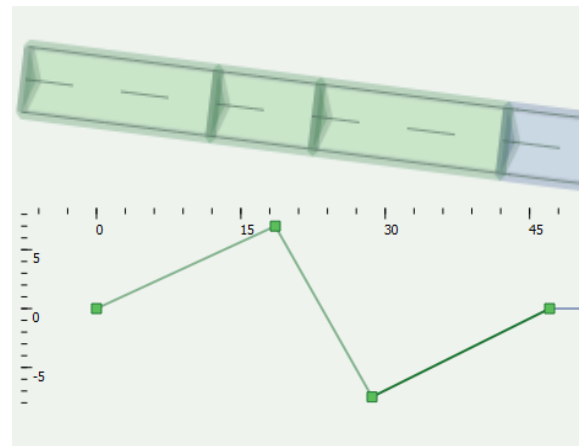


Figure 2.15: Elevation on a road part

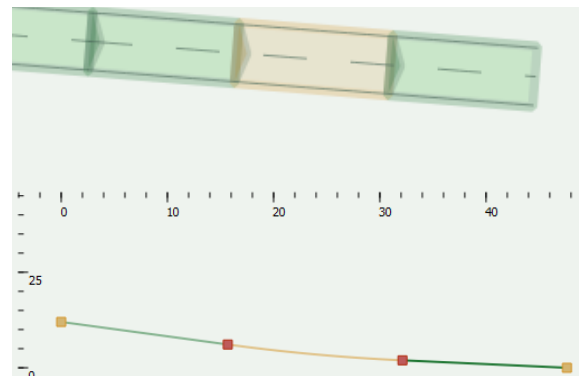


Figure 2.16: Smooth elevation on road

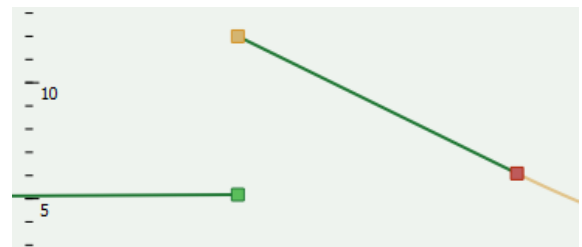


Figure 2.17: Cliff in a road

## 2.7 Lane

Here you can adjust your lane width and the shape of your lane. You can select each lane individually. The **“New”** function allows you to split your road into parts. With **“Delete”** you can delete those parts again. With LMB on **“Add Width”** you can create a second reference point within a road part without splitting it. That comes in handy if you want to modify the shape. As before you can drag the magnitude in the bottom window or you can enter it at the top under **“Add Width”** (see figure 2.18).

On the left side of your screen in the **“Settings View”** you can see the id and type of a lane. The id is a very important information. Everytime you connect two roads make sure they both have a positive or both a negative id! If you want to insert a lane, click on the cross in front of **“insertLane”**. Then enter the width/id you’d like and LMB **“insert”**

The lane that is inserted will have an unbroken line to the previous one. To change the look of the lane and likewise the traffic rule for e.g. overtaking, open the **“Tree View”** as in figure 2.20 and change under **“type”** to your desired look.

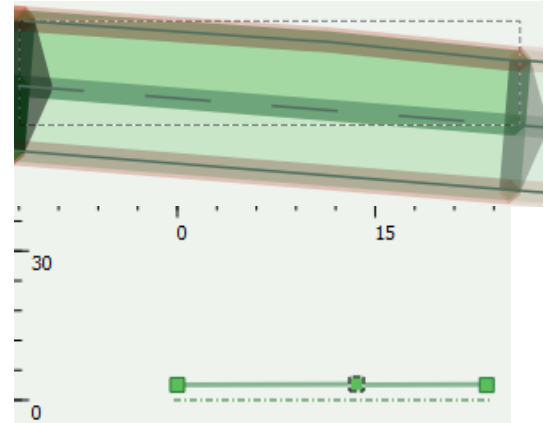


Figure 2.18: Lane with an extra width marker

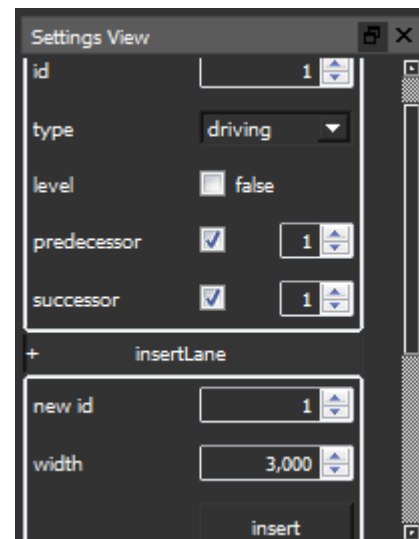


Figure 2.19: Settings View of a lane

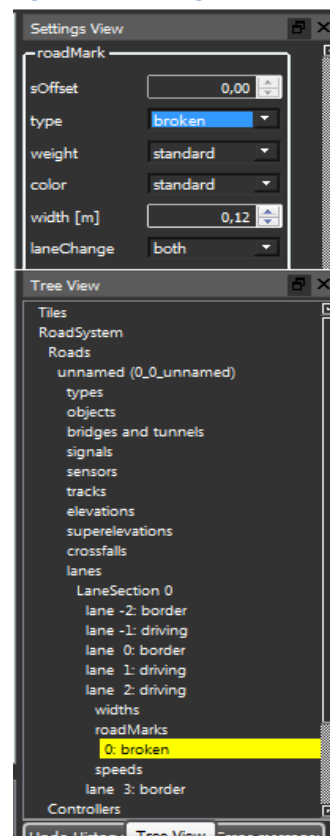


Figure 2.20: Tree View to change street marking

## 2.8 Junction

There are basically two ways to create a junction. One is with the automatic “**Circular cut**” option or in a manual way.

To create a junction with “**Circular cut**”, set your radius and then LMB “**Circular cut**”, move your cursor onto the white screen. A blue circle will appear, move the circle above the two roads you want to create the junction out of and click LMB (see figure 2.21). You will have to redo the “Road Links”, because Oddlot will make mistakes with other road parts.

A junction will be visible as a grey see through rectangle, its size is determined by the roads it is consisting of. Therefore, if the grey rectangle is too big or too small, check which roads are included. You are able to remove them with LMB on “**Remove**” and then LMB onto the road you want to be gone.

If you want to create a manual junction follow these steps:

1. make sure your junction looks like figure 2.22 and check the id's of your lanes, use “**Split**” to create the parts
2. choose “**ConnectingLane**” or “**ConnectingRoad**” and click the road parts that you want to connect.
3. multiselect all lanes you want to be included.  
A junction consists of the inner connecting roads/ lanes.
4. LMB on “**Create**”
5. check the road links and correct or complete them

Usually the automatic function should do it. A manual junction is more prone for mistakes. And it takes way more time.

*Note: you can use circular cut to create a*

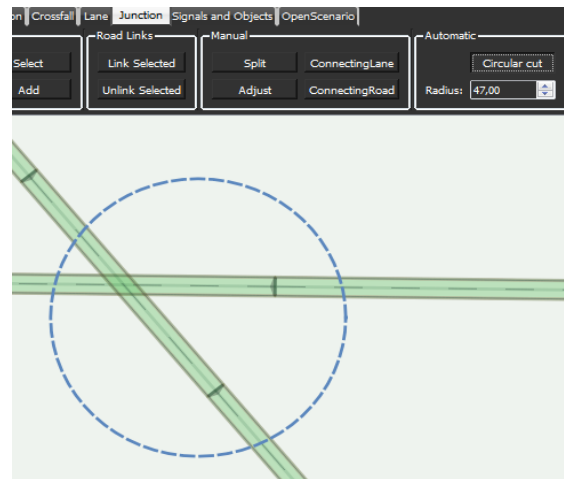


Figure 2.21: Circle of automatic junction

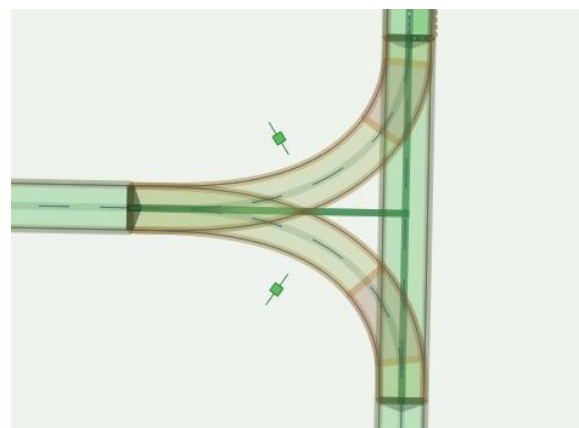


Figure 2.22: Preparing a junction

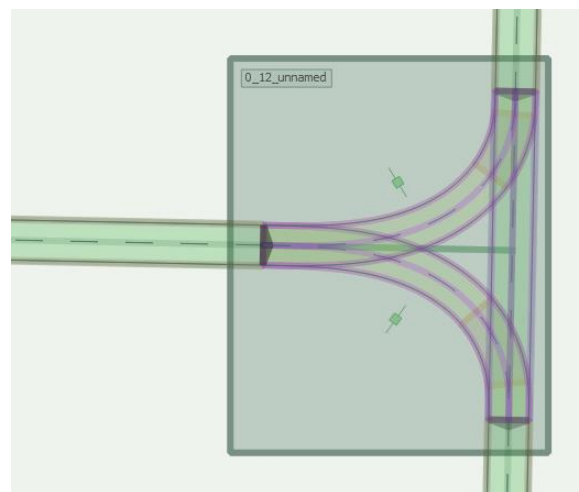


Figure 2.23: Complete junction

connection between two road parts.

## 2.9 Signals and Objects

After successfully creating your road map, the next step would be adding traffic signs. Therefore go to the “Signals and Objects” menu tab. On the right hand side of your screen, you can open with double LMB “**Signals**” or “**Objects**” (see figure 2.24). With double click you can open the tree further. Once you reach the tree part where pictures of traffic signs are shown, LMB on one and then next to your road. The traffic sign should now appear at the point where you clicked. If you click a placed sign and hold LMB you can move it around.

Note: Place traffic signs next to roads, in the simulation it will appear exactly where you put it. Therefore a driving car will crash into the sign in Figure 2.25.

If you do not know what meaning a sign has you can enter the number behind a signal with the prefix StVO for the “Germany” part.

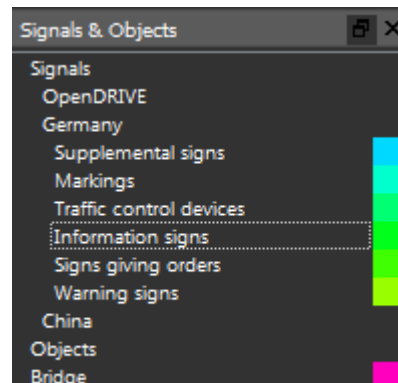


Figure 2.24: Treeview in Signals and Objects

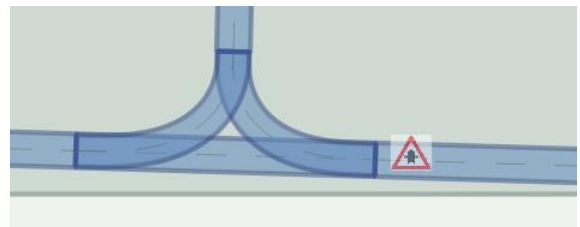


Figure 2.25: Traffic signal on road



## 3 Tutorials

### 3.1 Motorway Exit/Entry

Create a straight line and add two lanes to each side. As described in 2.7, change the look of the lane borders from “broken” to “solid” (see Figure 3.1). Then create the road that leads to your Motorway. Preferably orthogonal to your Motorway (see Figure 3.2).

With “**Connecting Lane**” create the exit and entry lane to your Motorway (see Figure 3.3). Therefore LMB the right/left lane of your slip road and the right/left lower lane of your Motorway, meaning the right or left piece of the middle road part.

Now create the junction as described in Chapter 2.8. Therefore go to the “Junction” Menu Tab and LMB “**Select**”, now draw a rectangle or multiselect the middle part of your motorway and the connecting lanes. After selecting LMB “**Create**”. The grey rectangle will appear and your selected lanes will get a purple frame.

For the next step you will have to create/correct the “*Road Links*”. As described in Chapter 2.1, select the junction and LMB “**Clean**” in your Settings Window. Now go to the “Road Link” menu tab, select everything and LMB “**Unlink**”. Again select everything and LMB “**Link**”. Figures 3.4 to 3.5 show the correct road links. Note: Figure 3.4 shows the right hand side of the motorway, for the left hand side it as to be symmetrical to the orthogonal axis of the motorway.

Now change the look of the border from broken to solid, like it is explained in chapter 2.7. LMB the “Lane” menu tab,

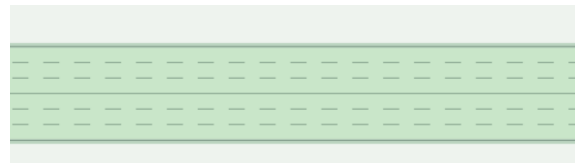


Figure 3.1: Lane design for a Motorway

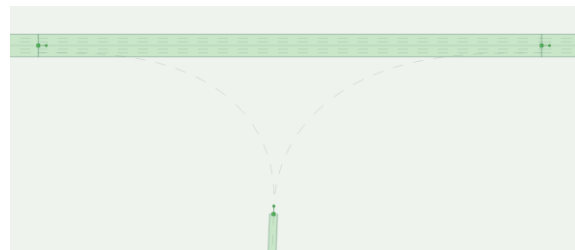


Figure 3.2: Splitted road and orthogonal slip road

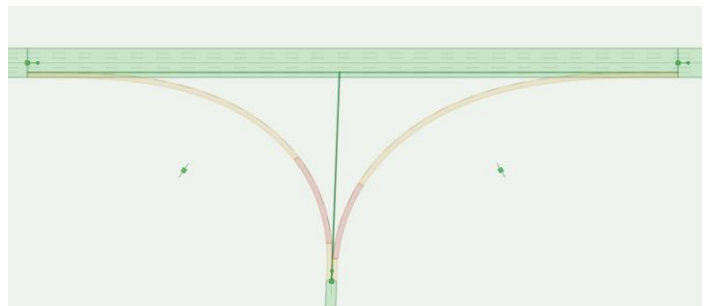


Figure 3.3: Connecting lanes for the motorway

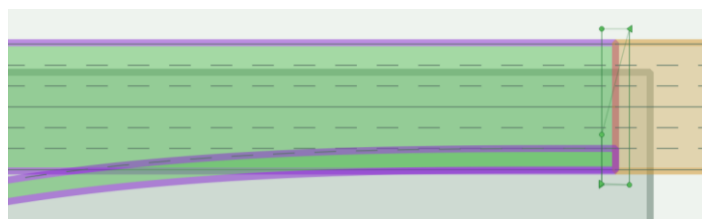


Figure 3.4: Road links on the Motorway

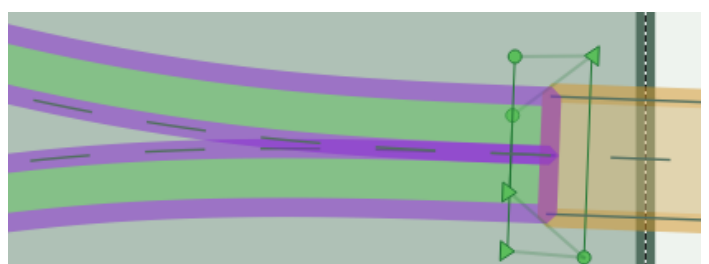


Figure 3.5: Road links at the connecting road

then LMB the lane and maneuver in the “Tree View” to the border. Now change the broken street mark into a solid. At last add a lane with the same id as you connecting lane and change the type from driving to “restricted” (see figure 3.6). If you want you can change the width of the restricted lane to make it look nicer. Now you have road marks on both sides. To complete the project add traffic signs and reduce the width of the lane, leading into the exit and entry, at their ends.

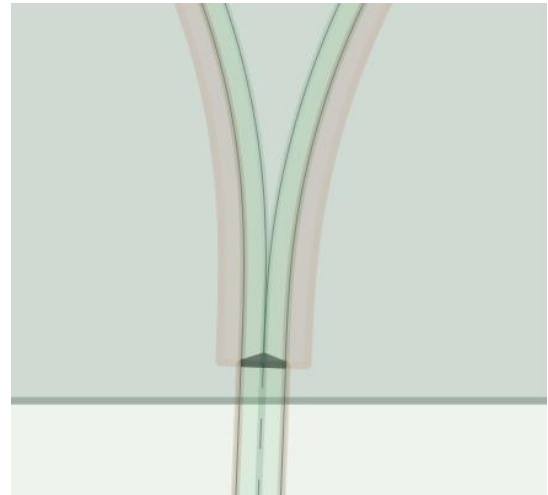


Figure 3.6: Restricted lanes at Highway entry/exit

### 3.2 Roundabout

To create a roundabout use the „Circle“ function and create a round track. Now change the type of the inner lane to restricted. Depending on how many roads you want to connect draw straight parts pointing towards the circle. Now create the connecting lanes, like you did it in the previous tutorial and create the junctions. It is an option to create one big junction, consisting out of the circle and the connecting lanes. A finished round about is pictured in figure 3.7. The road marks are still not correct. Therefore you have to split the road in order to remove the solid lines at the entry/ exit. You will have to use the **split** function under “Junction”. As you can see in figure 3.7 the road marks would prevent or prohibit cars from turning into or out of the roundabout. After the split turn the “solid” parts into “none” as described under 2.7. Now in order to get the correct “Road Links” merge the road parts that you splitted earlier. Figure 3.8 shows a revised part of the roundabout.

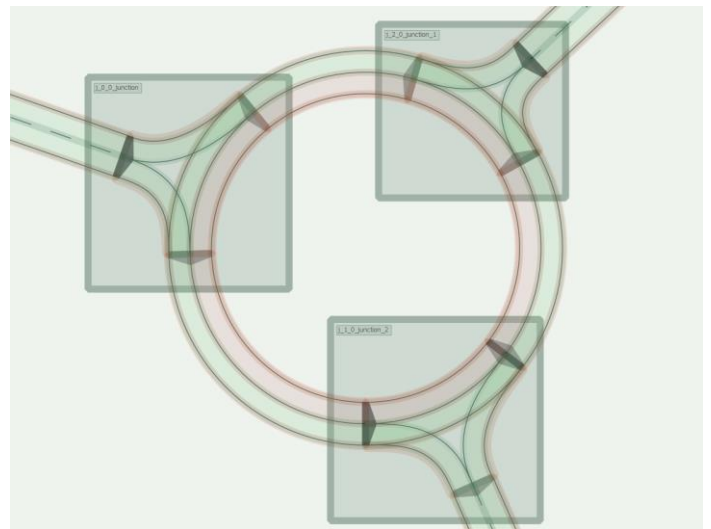


Figure 3.7: Almost finished roundabout

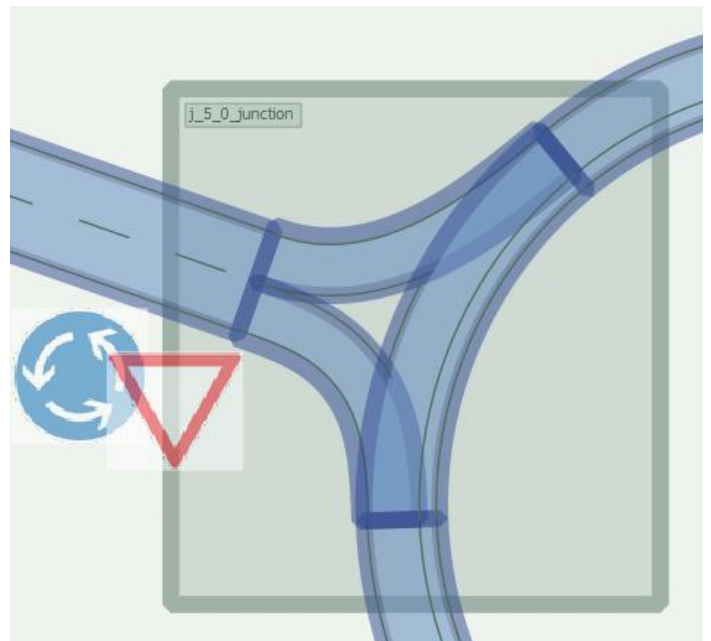


Figure 3.8: Finished junction of a roundabout



## 4. Online Maps

If you like to create an existing street map of your neighborhood, you can do so with the “**Load Map**” function. You will find it at the same level as the “**save**” button further to the right on your screen.

With “**Load Map**” you can insert the picture of a street map from your hard drive.

With “**Load Google Map**” you can insert a street map out of Google Maps. LMB the “**Load Google Map**” button, a new window will appear. Now you can enter the address or coordinates of your desired area into the “*Location*” field. For the address start with the street and house number then enter the city, you don’t need to use commas. Coordinates have to be entered like this: 12.3456, 9.8765. The first number is the degree of latitude and the second number is the degree of longitude.

You can choose between a satellite picture and the actual road map, therefore simply enter the desired type into the “*Map Type*” field. The last field “*Size*” adjusts the size of the map you load. Oddlot will insert quadratic tiles out of Google that have always the same size. You can only adjust the number of the quadratic tiles with the syntax: x, y. While x stands for the number of tiles in latitude, y stands for the number of longitude.

For “Load Bing Map” it is the same procedure as with Google. Except if you enter “roadmap” into the “*Map Type*” field you will get the satellite picture as well.

It does not matter which menu tab is activated, you can always move the tiles around and use the “**Delete Map**” function to delete one tile or all the selected tiles at once.

If you activate “**Lock Map**” you will not be able to move or delete any tile. If you deactivate it afterwards you can delete and move the tiles again.

## 5. Visualisation with COVISE

### 5.1 How to open a .xodr data set

Once you created your road map you can take a look at it using COVISE. Look for the “COVISE Shell” by LMB the Windows button on your “Desktop”, now enter “COVISE Shell” into the search bar. Once opened you have to enter the correct path to your data set into the window.

- Use “**cd ..**” to get into the parent folder and hit enter ←
- To change hard drives enter the according letter e.g. “**S:**” and hit enter ←

```

COVISE Shell
Environment settings for ARCHSUFFIX zebuopt
C:\Program Files\COVISE>cd ..
C:\Program Files>S:
S:\>
  
```

Figure 5.1: Using cd.. & changing hard drives

- In order to enter the subfolders, where your data is located, simply enter the path with “**cd**” in front e.g. “**cd Samplefolder**” ←
- If you want to go through different subfolders enter “**cd subfolder#1\subfolder#2**” you will now enter “**subfolder#2**” and hit enter. ←
- Once you entered the folder where your data set is located. Enter “**opencover nameofdata.xodr**” and hit enter. ←

```

COVISE Shell
Environment settings for ARCHSUFFIX zebuopt
C:\Program Files\COVISE>cd ..
C:\Program Files>S:
S:\>cd Sample Folder
S:\Sample Folder>cd subfolder#1\subfolder#2
S:\Sample Folder\subfolder#1\subfolder#2>
S:\Sample Folder\subfolder#1\subfolder#2>opencover Stuttgart A8 Airport.xodr
  
```

Figure 5.2: How to enter folders and open data with COVISE

If everything is correct COVISE will open the data you created with Oddlot.

### 5.2 View handling within COVISE

In order to move in a world you have to use the mouse.

Verbindung von zwei straßen über circular cut

Tile tools sinds stücke die vorgefertigt sind und eingefügt werden können.

Wizard kann Daten von höhen profil auf strecke übertragen Bsp.: Straße von Stuttgart nach Tübingen mit höhendaten vom amt passen mit xodr zusammen und können eingespielt werden.

Manuelle Junction soll nur innere Stücke enthalten. Vergleich mit circular cut