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OpenStreetMap

Using and Enhancing the Free Map of the World

SAMPLE CHAPTER



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5 Mapping Practice

In this chapter we show you how to get started with mapping. You will see how to survey for OpenStreetMap and how to upload your data to the database.

OpenStreetMap has steadily increased in complexity. The large user community is constantly devising new and clever ways to improve and fine-tune the mapping process. Bewildered newcomers often look at the map display in an editor and ask themselves: How can I ever survey and enter that much detail? But a map is created in many iterations, often by different people. To give you an idea how a map develops, we will pick a hitherto unmapped area for our example, and we will leave out some details at first. The following chapters will then explain things in depth.

5.1 A Typical Mapping Example

We will accompany our exemplary mapper Max as he surveys an area for OpenStreetMap. He takes his GPS receiver, empties the track memory, and checks the settings. Max grabs a notepad and pencil and leaves his hotel room. Outside the hotel, he waits until the GPS receiver acquires a fix, receiving signals from enough satellites to determine its location.

His hotel is called the Mulberry Inn – Max doesn't even have to take one step before he can set his first waypoint. He presses a button on his GPS receiver, and the device responds with “001”. Max makes a note of this on his notepad, “001 Mulberry Inn”, and walks down the road to his right. It is a residential road; he doesn't have the name yet, but he writes it down as “highway=residential” nonetheless. Experienced mapper that he is, Max knows his “map features” by heart, including all the road types usually assigned to the highway key. For less experienced mappers, we provide an overview of road types on page 64. After a short walk, Max reaches a junction with two road signs: The road he is on is called Castle Way, and the road branching off to the left is Tower Road. Max instructs his GPS to store the current location as waypoint 002 and continues ahead.

After a few meters, Max notes a little stream passing under the road – waypoint 003: Who knows, maybe it will come in handy later. Max continues on Castle Way and finally reaches a busy main road, the name of which he can't find out. He adds another waypoint and decides to turn back and take Tower Road. On his way he passes a post box and marks it as waypoint 005 in his notes, together with its compass direction.

001	Mulberry Inn (residential)	006	+ footway.
002	Castle Way + Tower Rd oneway↑	007	← Station Rd.
003	∩ Stream	008/9	Park
004	T secondary?	010	+ Willow Wy.
005	post box N.	011	+ footway
		012	T Castle W.

Figure 5-1: Reference notes for this mapping tour.

Tower Road is a one-way street, and Max duly notes the fact. In between two houses he sees a footpath branching off to the left. He does not follow the path but records a waypoint (006) there. Reaching the end of Tower Road, Max turns left into Station Road (007). There is a little park on the right-hand side. Max passes it by at first but then decides to quickly walk down the arc-shaped footpath through the park, recording waypoints 008 and 009 where it leaves and rejoins the road.

He continues on Station Road and then makes a left turn into Willow Way (010). Soon after that he sees the same footpath (011) which he had noticed branching off when walking down Tower Road. Max continues straight on, and soon he is back on Castle Way (012). Turning left, he is quickly back at the hotel.

In the peace of his hotel room, Max inspects the data he has collected. He transfers the GPS data onto the computer where it is stored in a GPX file. Max then uses the upload website <http://www.openstreetmap.org/traces/mine> to send his raw GPX files to the OSM server. In doing so, he specifies a short description and a number of keywords to make it easy for him (or someone else) to find the file later.

Max now fires up the JOSM editor (see chapter 10) and instructs it to open the GPX file he has saved from his GPS (figure 5-2).

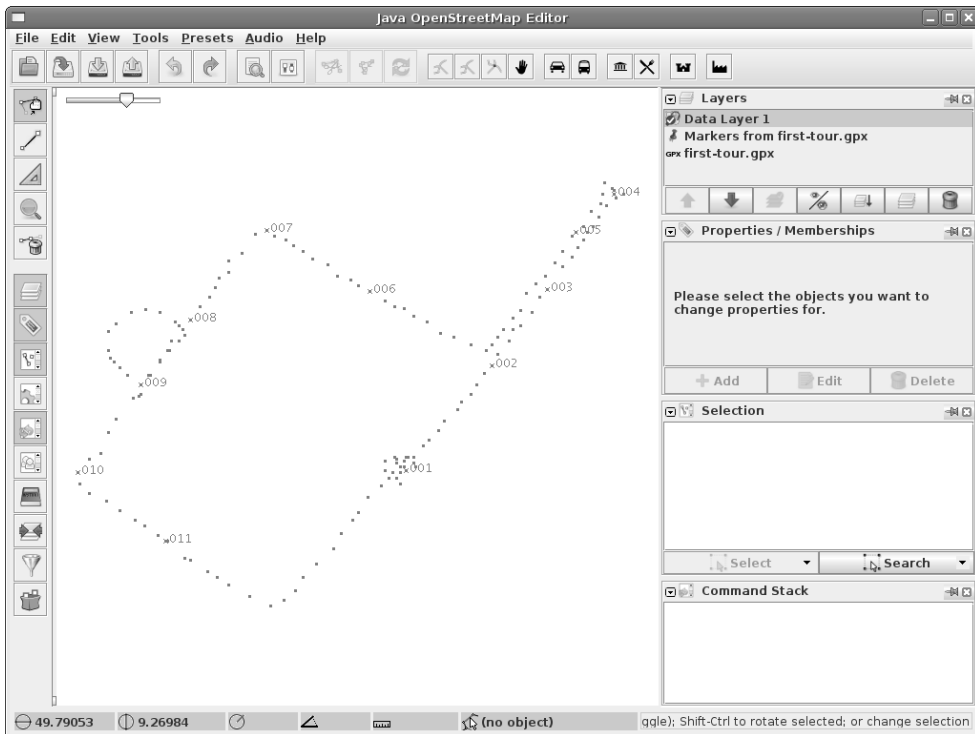


Figure 5-2: GPS track and waypoints for this mapping tour in JOSM.

Max has a decent GPS device, and his steps have been traced accurately, the only exception being a point cloud where Max stood waiting in front of the hotel at the start of his walk. As we said, such point clouds are often recorded while the GPS device is acquiring a signal after being switched on. All waypoints look correct, and they match the entries Max has written on his notepad.

Before Max can begin to enter his data, he has to cross-check what data is already available on the server. When he did so a few days ago, the area was a blank spot on the OSM map, but what will it look like now?

The JOSM Editor automatically selects the currently displayed area when downloading. Max zooms out a little bit to include data in the vicinity, and then instructs JOSM to download data from the OSM server (figure 5-3).

How cool! The busy road where Max turned around is already present in the data on the server, but nothing else is there.

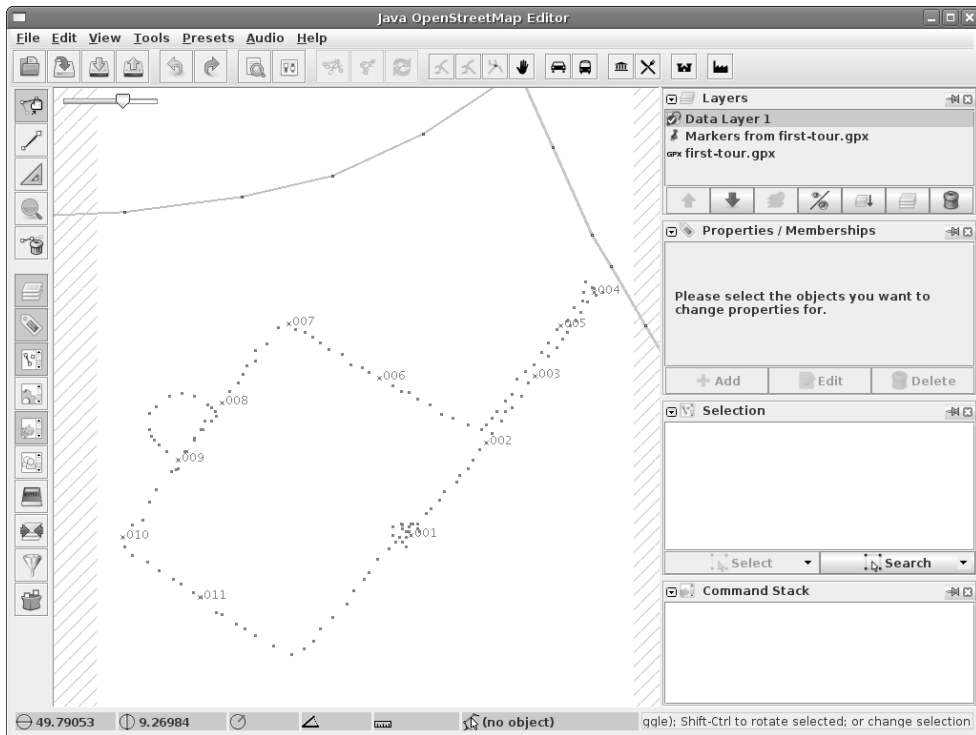


Figure 5-3: Data downloaded from the server.

Max draws the four new roads. Although the GPS trackpoints don't make a perfect straight line, Max remembers that the roads are straight, and he is content with placing one node at each corner rather than one node at every position recorded by the GPS device.

After he has completed the road layout, Max starts entering the attributes. Since all roads surveyed are residential roads, Max uses the tag `highway=residential` for all of them (see figure 5-4). In addition, Tower Road gets tagged with `oneway=yes`. And of course he also enters the names from his notepad for each of the roads. There is more about road tagging in section 7.1.

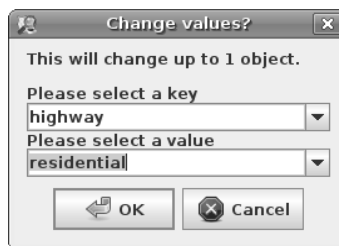


Figure 5-4: Adding a tag to an object.

In the North-East, Max connects his newly surveyed Castle Way to the existing road he has downloaded.

Figure 5-5 shows the map on screen after Max has entered the roads and their attributes.

Max now tackles the next items on his list, which are a bridge over a small stream, and the post box. To map the bridge he inserts two nodes into Castle Way and splits the road into three sections. Then he can tag the middle section with the additional tags `bridge=yes` and `layer=1`. There is more about tagging bridges and tunnels in section 7.1.

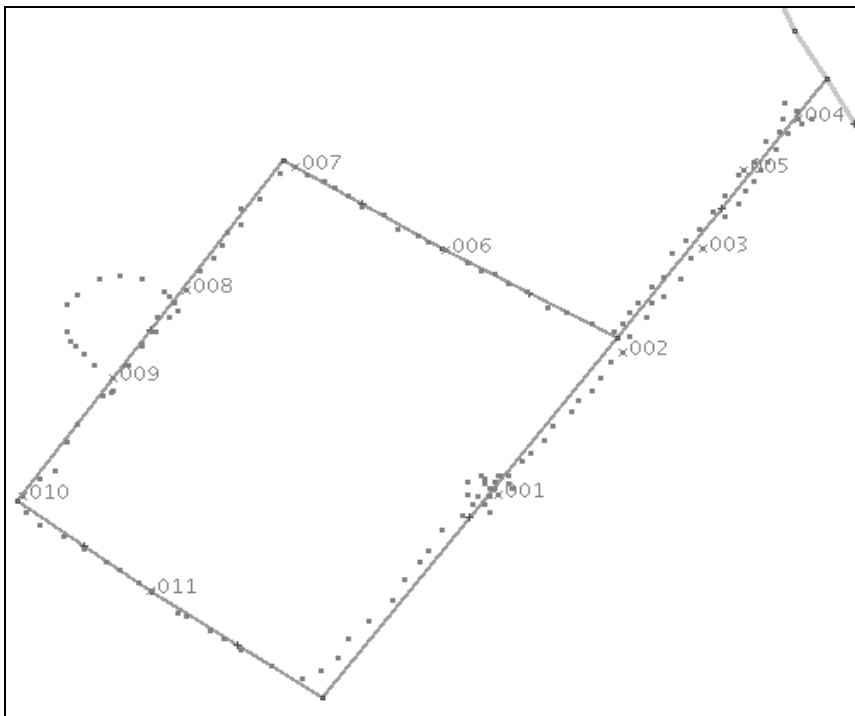


Figure 5-5: Max has entered the roads he surveyed.

Max doesn't have any information about the path of the stream, but nonetheless he draws the section he could see from the bridge. Maybe he (or someone else) will find some aerial imagery later that can be used to complete the stream, or the mapping of further bridges will lead to someone making a reasonable guess about where the stream runs, and map more of it.

For the post box, Max inserts a node, but he can't remember the correct tag to use so he opens the "presets" menu in the JOSM editor. There is a "man made" section, and in there he finds an "amenities" menu, which then offers the option "post box". Selecting this op-

tion, Max is asked about the operator of the post box (in many countries there is no monopoly so it makes sense to specify that). The node is then tagged `amenity=post_box`. The same tag could have been entered manually; there is nothing special about using presets. For `amenity=post_box`, the editor displays a letter symbol at the location. Read more about tagging points of interest in sections 7.4 and 7.6.

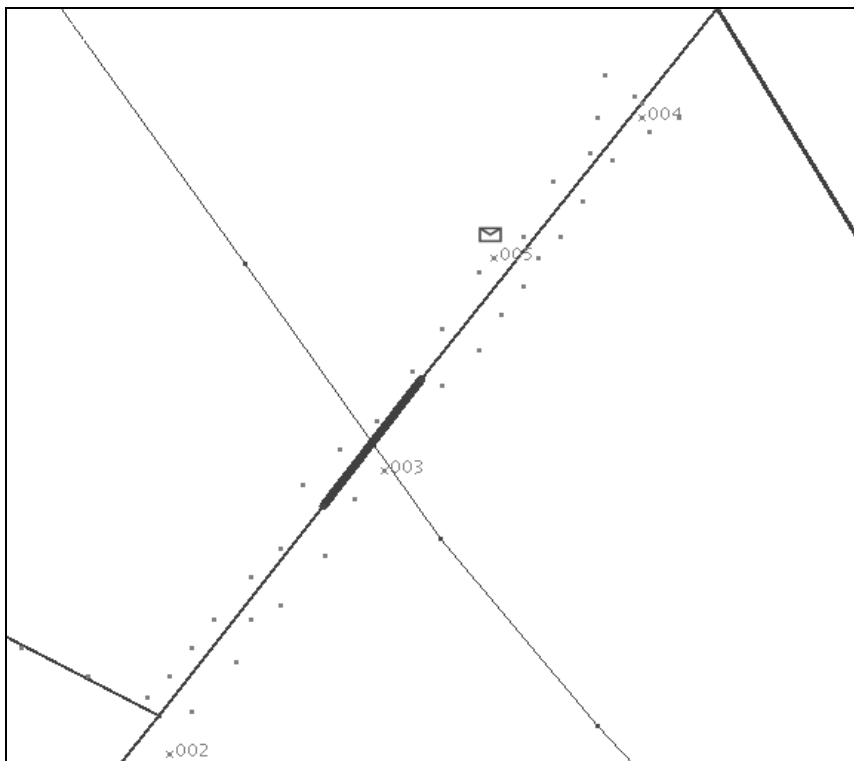


Figure 5-6: Stream, bridge, and post box.

There are three remaining items in the south-western part of the area surveyed: A park with a footpath, a hotel, and a path connecting two roads but without a GPS track.

Max adds the park with a rectangle tagged as `leisure=park`. More about tagging natural and leisure areas in sections 7.2 and 7.4. The footpath leading through the park is recorded as `highway=footway` and connected to the road.

The path connecting Tower Road and Willow Way is also recorded as `highway=footway`. Max doesn't have a GPS track, but on passing each end it was obvious that it was reasonably straight and direct. Since Max is aiming for perfection today, he adds `source=extrapolation` – which means “this isn't really surveyed but rather guesswork”. This could prompt someone to refine it at a later date.

Finally, Max enters a node where his hotel is: `tourism=hotel, name=Mulberry Inn`. At reception, Max had seen a leaflet with a building outline; if the TV gets too boring then he might even draw it and tag it `building=yes` to make the map even more complete.

Figure 5-7 shows Max's final results in the editor.

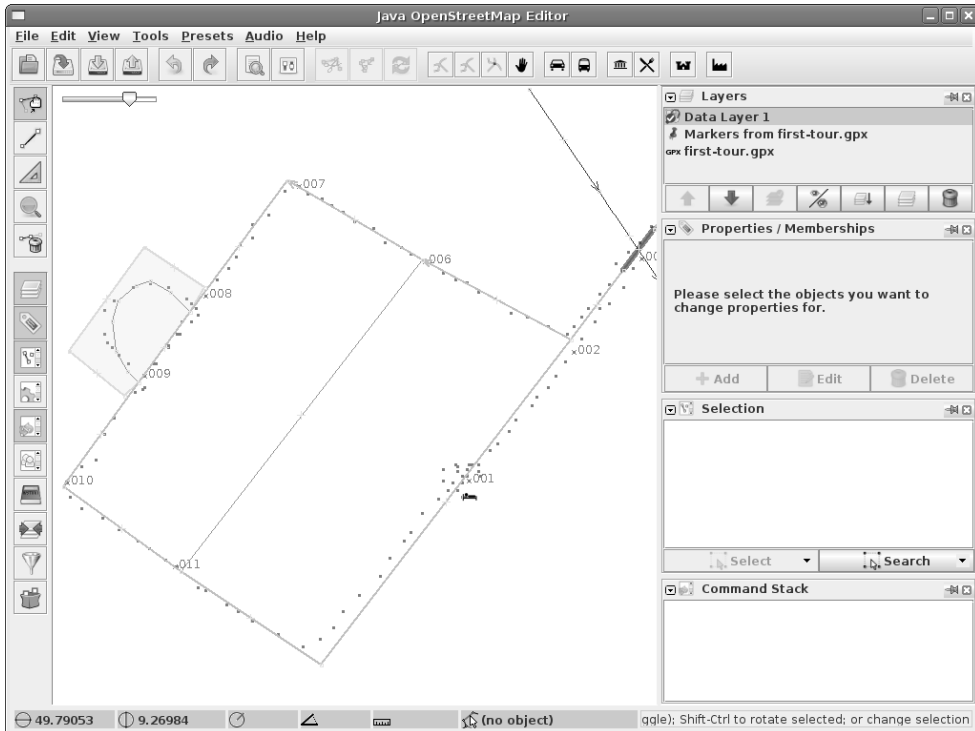


Figure 5-7: All data has been entered.

Max is happy with what he has achieved, and with a click on the upload button (fourth from left in the button bar at the top) he initiates the data upload to the OSM server.

Other users who download data for this area will see the new features immediately. Additionally, the changes will be made available in a change file on the server within minutes, and this file will be downloaded and processed by a number of mirror servers around the world. Other systems that carry current OpenStreetMap data perhaps only receive data changes in daily batches, so they will get Max's data in their next daily update.

Many map image servers, including the main tile server at www.openstreetmap.org, will automatically be aware of the changes and re-draw the map for the area within hours or even minutes. The work Max has done is in high demand!

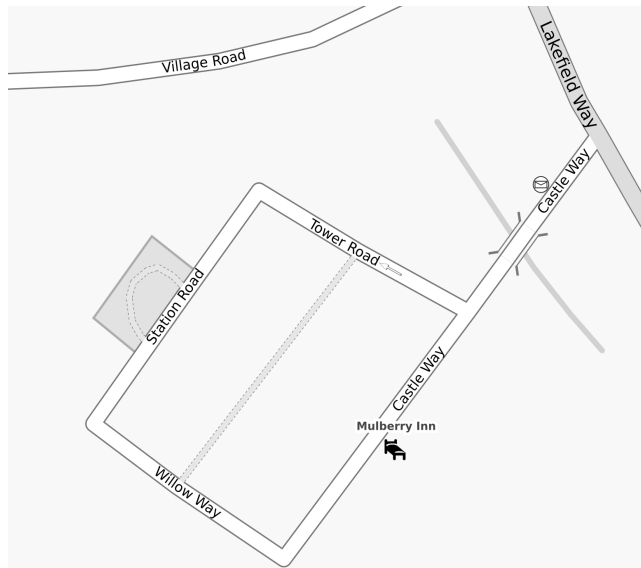


Figure 5-8: The finished result (see also color plate 6).

5.2 Notes and Recordings

GPS tracks are an important basis for mapping, but they are of little use on their own; they need to be accompanied by extra information like street names, road types, and points of interest. Newcomers to OSM are often surprised about this, because the press likes to simplify everything and is prone to claiming that OSM collects GPS tracks and combines them into a map. As is often the case, things are not so simple in reality!

You can record additional information in various ways. How you do it depends on your personal preferences, as well as your mode of transport. You can conveniently make notes on a slip of paper when you are traveling by train, but you will be less inclined to attempt this when riding a bicycle or motorcycle.

Mappers typically use paper to prepare written notes, or they record spoken notes on a voice recorder or an MP3 player. Some also use a digital camera to record street names and other interesting bits of information.

Mapping with a notepad (and, perhaps, a clipboard) gives you the ability to make quick sketches, for example when mapping a complex junction. If you are mapping an area that already has basic coverage in OpenStreetMap, you can print out the existing data and scribble notes on that. But be aware that making notes that you can still decipher at your PC a few hours later does require a certain diligence – it is easy to forget this when you are on the road and want to map things quickly!

If you use a voice recorder or an MP3 player, record your waypoint on the GPS first and then speak the number of the waypoint together with the description. This is a very efficient way of recording information, and you can describe things in more detail than on paper. If you are mapping by bicycle, you might be able to record the information without even stopping. A typical spoken note could be “waypoint 17: Abraham Road, residential” (consider spelling out difficult names letter by letter), or “waypoint 23: post box South-East”. Specifying the compass direction instead of “left” or “right” makes postprocessing of the data easier; you don’t have to be aware of the direction of travel.

When shopping for a dictaphone or an MP3 player to record spoken mapping notes, try to get a model where you can activate recording without having to look at the device – ideally by pressing a prominent button. On the road, you won’t have the time or patience to find the right option in an on-screen menu. You will probably have to perform a number of test mapping rides in order to find the best way to hold or mount the device and operate it while mapping.

If you are mapping with a camera, take pictures of road signs and anything you want to put on the map later. The camera will record the exact time the picture was taken, and by matching the timestamps with the GPS track later you can determine the location of the picture.¹ If you tend to forget the direction in which you shot the photo, here’s a trick to help you. Imagine that you’re driving past a restaurant that you want to map. Then take three photos – one of the road in front of you, one at 45 degrees to show the road and the restaurant, and then a 90 degree shot of the restaurant so you can read the name.

Blurring can be a problem when taking photos of road (or other) signs, especially when moving. A big advantage of photos, however, for recording mapping data is that you won’t introduce spelling errors with difficult names, and a camera release button can usually be operated even with motorcycle gloves on.

The OpenStreetMap editor JOSM, which we will cover later, has a built-in function to match photos or MP3 sound files to GPS locations, and to display or play them from within the editor. See chapter 10 on page 116.

Be aware that using a camera to photograph road signs could look a little strange: Be prepared to answer questions from worried residents and to explain OpenStreetMap to them.

5.3 Working with the Map

When you go out mapping, it is really useful to carry an OSM map of the area to see which bits are covered already. This map could be a paper printout, or it could be on your PDA or

¹ There are cameras that record the current GPS position together with the photo, but they aren’t widely used. Mobile phones equipped with both a camera and GPS often offer this option, too.

On the project web page you can select an area from OpenStreetMap and generate a PDF file to print out. Take the printout with you and add things that are missing, just like you would do if you had printed the map directly from OSM.

Using a scanner, you load the map back into your computer, and send it to the Walking Papers website. Walking Papers will now analyze the QR code (the strange looking rectangle in the bottom right corner of the map), and use that information to georeference and straighten the document. After that, you can load your handwritten notes into your favorite editor² as a background layer and transfer them into tags on OpenStreetMap.

5.4 Working with Aerial Imagery

Instead of moving about with your GPS device, you can often map roads, rivers, or lakes conveniently from home by tracing them from aerial imagery. OpenStreetMap currently has two important sources for such imagery: The NASA Landsat images, and the satellite or aerial imagery from Yahoo.

The Landsat images are of rather coarse resolution, but they are in the public domain and so they can be used without license issues. While unsuitable for discerning features in an urban environment, they are a good source for drawing the outlines of lakes or forest areas. Rivers, railway lines, or major roads can usually be seen as well.

The Yahoo satellite and aerial imagery is copyrighted. However, Yahoo has declared that their terms of use do allow tracing features from them, and that these traced features may then be distributed under the OpenStreetMap license. The Yahoo imagery is of varying quality; in some areas you can see every single road even in a city, while in others they aren't any better than the Landsat images.

Generally, roads and building outlines can be traced from aerial imagery very well. Note, however, that these images aren't always positioned correctly: Depending on the provider, they may be mislocated by several hundred meters. In the major editing tools, you can correct such problems if you have a reliable GPS track (for JOSM see section 10.8; for Potlatch see section 9.9). Also remember that these images may well be several years old, and that the detail may have changed since they were taken.

Aerial imagery is ideally suited for creating a basic grid of features in an unmapped area so that you have something to start with when you head out into the field. Working in the field can't be avoided – the images don't tell you the name of a street, or whether it is a one-way street, and you can't copy that information from other maps (see chapter 13). Remember that OpenStreetMap is allowed to use Yahoo imagery but not Yahoo maps!

² The Walking Papers web site has instructions on how to do this with your particular editor.

5.5 More Mapping Tips

OSM mapping is, in most cases, a two-stage process: First you collect raw data in the field, and then you improve the database with it. No matter how you make your field notes, it makes sense to think about how you will later convert them to OSM objects. For example, when you travel along a road, you usually record the name and determine the value of the highway tag that best matches the road classification (see chapter 7 for established highway types).

How you travel along a grid of roads can also be optimized for later track processing. For example, if you make a left or right turn at an intersection, then it will be difficult later to see whether there was a bend in the road there or an intersection. If you go straight on and later cross your own track, then the GPX trace shows clearly that there was an intersection there. If that isn't possible, then you should at least record a waypoint and make a note saying that there was an intersection. If you have to push your bicycle for a short way to get from one road to another, be sure to note that down, lest you might be tempted to enter a road or cycleway later when in reality there was only a footpath.

It is usually a good idea to routinely set a waypoint at each intersection so that you can refer to that in your notes (“post box North-East intersection 37”). If you are mapping a fairly rectangular grid of roads then you can probably skip many of the connections and just note down that there was a road connecting two waypoints – just as Max did with the footpath in our example.

And one last tip: It is almost impossible for a beginner to think of everything during their first mapping trips. With time, you will get more experienced, and things will become much easier. Don't aim too high initially. Perhaps just map the streets on your first outing, and skip the footpaths and points of interest. Go mapping for just half an hour and then enter the data into an editor. On your next trip you will already have a clearer idea of what to look out for to make the editing work easier. With experience you will soon become faster. Mapping a complex intersection might be too much for you during your first days as a mapper, but don't be afraid to leave it out, and return to the area when you feel more confident.

bookdepository.co.uk has world-wide free shipping. The book can also be ordered through book stores and amazon.com or amazon.co.uk. There is also a German version of the book which can be ordered through Lehmanns or amazon.de. You can learn more about OpenStreetMap on these web sites. This part of the book is aimed at hackers and developers. We discuss the depths of the OSM database server and its API, we explain imports and exports and discuss important tools used for processing OSM data.

21 Writing Software for OSM.

21.1 Working with Large Amounts of Data.

With a map collection covering the entire world, I am no OS expert, and I have always found it difficult to put my finger on an exact item of information, which I know exists somewhere in one of the many books and articles, but cannot remember where. Chris Higley has now provided a way in to this detailed material. In addition, the sheet indexes included are very clear and a useful resource (they are also available online at the Charles Close Society website). As a general introduction to Ordnance maps the book works very well and I certainly wish I had had it some 20 years ago. Even now, I ha