Technische Universität Berlin

Fakultät für Elektrotechnik und Informationstechnik

Manual

RoadRad Documentation

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Fakultät für Elektrotechnik und Informationstechnik

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Chapter 1

Installation

At first you need an UNIX running system, for example Linux, Mac OS or cygwin for MS Windows. Make sure, that your working system has an updated python version. Then you have to install the python image library (PIL) (http://www.pythonware.com/products/pil/) and lxml (http://www.http://lxml.de/) depend on your python version. The PIL is for generating images and lxml for parsing the xml files.

The second step is installing RADIANCE on your working system. You get RADIANCE from http://radsite.lbl.gov/radiance/download.html. Run the makeall script and follow the installation description. Then add the following lines to .bashrc in your home directory (if not exist, add to .bash_profile).

```
RAY=/usr/local/ray
RAYBIN=/usr/local/ray/bin
RAYPATH=.:$RAY/lib export RAYPATH
MANPATH=$RAY/doc/man:$MANPATH export MANPATH
PATH=$RAYBIN:$PATH export PATH
```

To get the source code you require Git. Then connect to //limaster.li.tu-berlin.de/server and mount this drive as „z“. Now you can clone the repository with the source code.

```
git clone
z:/Mitarbeiter/Code/Simulation/Radiance/Strassenbeleuchtung/Repository/ YourDir/YourRepositoryName
```

Now you have something like „YourDir/YourRepositoryName/RoadRad/src“. The last step, make a folder named scene in „YourDir/YourRepositoryName/RoadRad/“.

1.1 Additional Information Mac OS

There is a workaraound, if the normal radiance installation does not work. On the limaster server is a compiled radiance version, copy it to the system folder.

```
sudo su
cp -rv /Volumes/server/... /usr/local/ray
cd /usr/local
chmod -R 777 ray
```

For Mac OS you can use macports to install all required software.
install Git:

```
sudo port install git-core +svn+bash_completion
```

choose you Python version or install

```
port select –list python
sudo port select –set python python27
```

install PIL for Python 2.7

```
sudo port install py27-pil
```

install lxml for Python 2.7

```
sudo port install py27-lxml
```

1.2 Additional Information Cygwin MS Windows

To use RADIANCE on MS Windows, you need an UNIX emulator eg. cygwin (http://cygwin.com/install.html). At first load and execute setup.exe. Then choose Install from Internet.

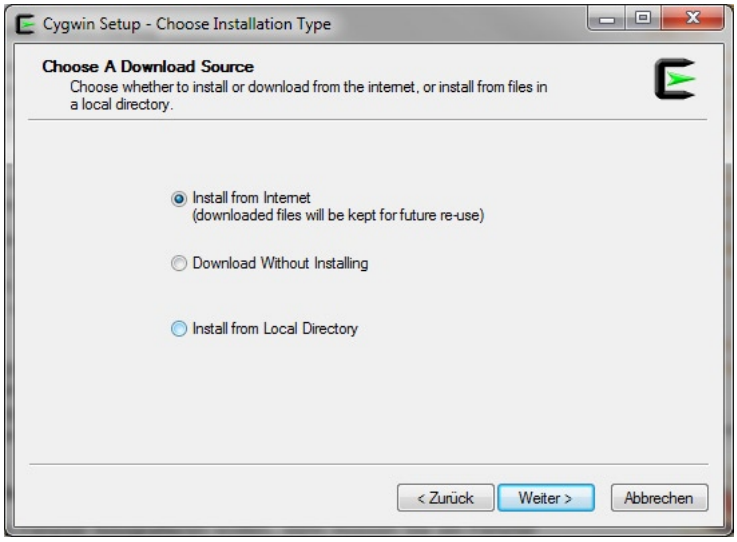

Figure 1.1: installation options

In the next two steps you can choose your installation folder and temporary download folder. Then choose the direct connection to server.

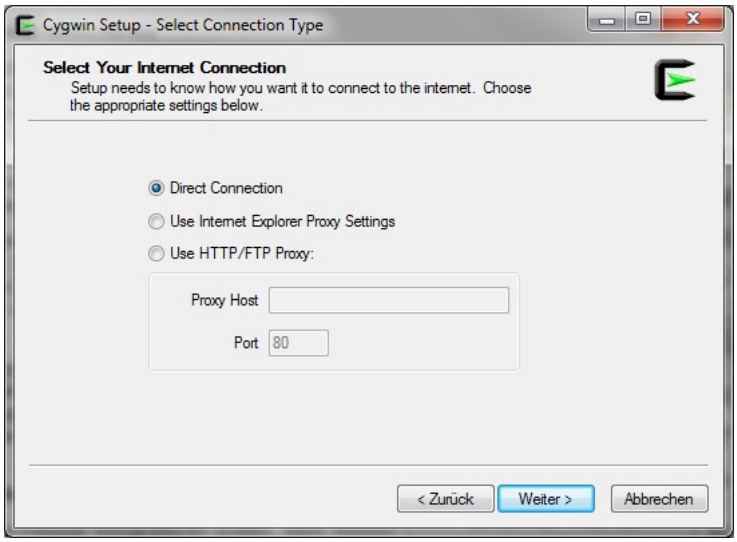

Figure 1.2: internet connection

Now you have to choose an download server from list. (Try to take a fast server eg. from germany university).

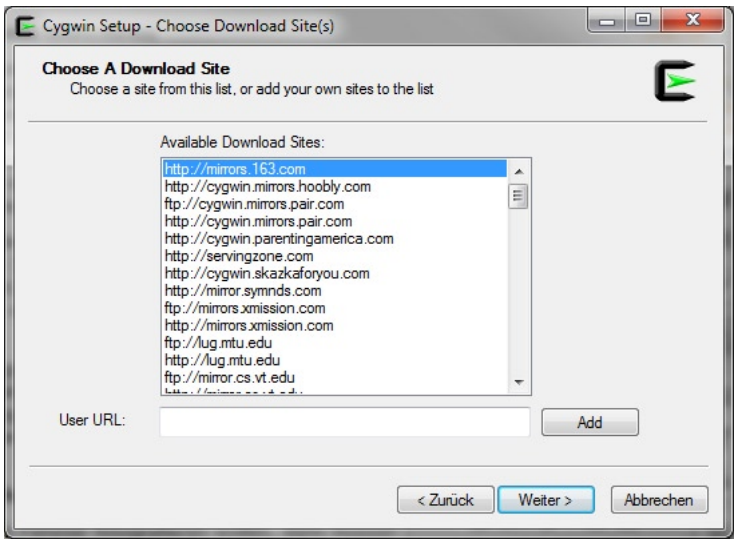

Figure 1.3: download site

At last step you can choose your packages. If you dont know, which packages you need, choose install all.

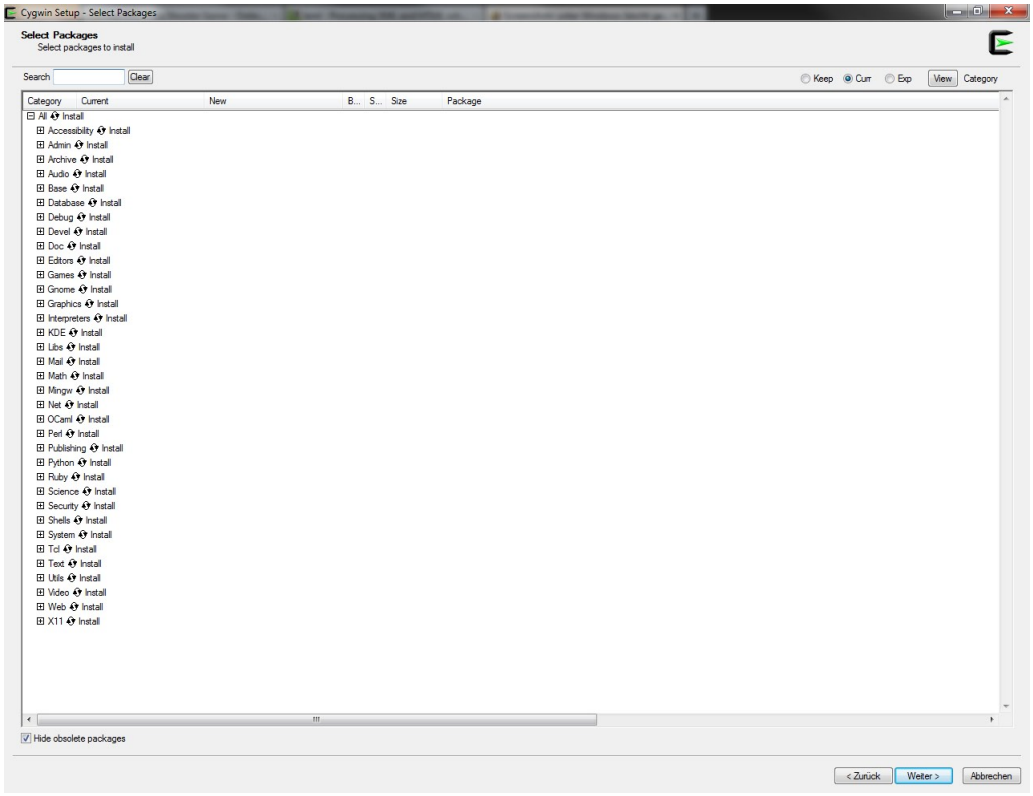

Figure 1.4: packages selection

Now you can install PIL and lxml. Download compiled versions from internet into a subfolder from cygwin (eg. cygwin/home/User/Downloads). Open terminal and navigate to your downloaded folders. Use lxml and PIL setup.py.

```
python setup.py install
```

If you get an error you have to rebuild your memory on cygwin. Open /bin/ash.exe and type:

```
/bin/rebaseall
```

Now repeat the installation script.

Chapter 2

XML Variables

There are some specific variables saved by an external xml-file (sceneDescription.xml), given in src-folder. These variables modify the scene and simulation parameters. The following table describes the parameters and valid values.

XML Child	XML Parameters	Typ	Values	Description
Description	Title	String		title of the scene
	Environment	String	Grass, City	grass only planar scene, city two boxes left and right side
	FocalLength	Float	0 - 100	length of ray focus in m
Road	NumLanes	Integereger	≥ 1	number of numlanes
	NumPoleField	Integer	≥ 1	number of measurment fields
	LaneWidth	Float	> 0	lane width in m
	SidewalkWidth	Float	≥ 0	width of sidewalk in m
	Surface	String	R1, R2, R3, R4, plastic, C1, C2, C2W3, C2W4, BRDF	typ of road surface / pavement
	qZero	Float	$0 \geq 1$	factor to change integreted q_0 in r-table
Calculation	DIN13201	String	on, off	switch for calculation
	VeilingLuminance	String	On, off	switch for veiling luminance
	VeilingLuminanceMethod	String	Standard, rp800	Ask Sandy
	TresholdLuminanceFactor	Float		Ask Sandy
ViewPoint	Distance	Float		distance to measurementfield in m
	Height	Float		height of the observers eye in m
	TargetDistanceMode	String	fixedViewPoint	observer goes with target or stays at position
	XOffset	Float		offset of the x-position of the observer in m
	ViewDirection	String	first, last, fixedRP800	viewing point
Target	Size	Float	0.3	size of the target
	Reflectancy	Float	$0 \geq 1$	absorption of the target
	Specularity	Float	$0 \geq 1$	0 ¯100 % diffus, 1 ¯100 % specular

	Roughness	Float	$0 \geq 1$	only for plastic if its non linear
	Position	String	Left, Right, Center	x-position on numlane for target and observer
	OnLane	Integer	$\geq$ NumLanes	target position on numlane
LIDC	Name	String		name of the LIDC .ies file
	LightSource	String	LED, HPS ..	light source type for rgb color
	LightLossFactor	Float	$0 \geq 1$	LLF light loass factor of RP800
	SPRatio	Float		Ask Sandy
Headlight	LIDC	String		name of the given LIDC declared in LIDC
	HeadlightDistanceMode	String	FixedHeadlightPosition, FixedTargetDistance	goes with target or stays at position
	Distance	Float		distance of headlights in m
	Height	Float	0.8	height of the headlights in m
	Width	Float	1.8	width of the headlights in m
	SlopeAngle	Float	0 - 90	angle of slope in degree
	LightDirection	String	same, opposite	headlights in observer view direction or opposite
	OnLane	Integer	$\geq$ NumLanes	headlight position on numlane
PoleArray	Height	Float		height of all poles in array must be same in m
	Spacing	Float		space between all single poles in m
	Overhang	Float		x-offset of the polearm in m
	IsStaggered	String	True, False	
	LIDC	String		name of the declacered LIDC in LIDC
	Side	String	Left, Right	polearray left or right side of lanes
PoleSingle	Height	Float		height of pole in m
	Overhang	Float		x-offset of the polearm in m

LIDC	String		name of the declacered LIDC in LIDC
PositionY	Float		y position of the single pole
Side	String	Left, Right	pole left or right side of lanes

Chapter 3

Folder Structure

The RoadRad main programm has following important standard files and folders: The src-folder is the folder for the working files. The following picture shows all files and subfolders.

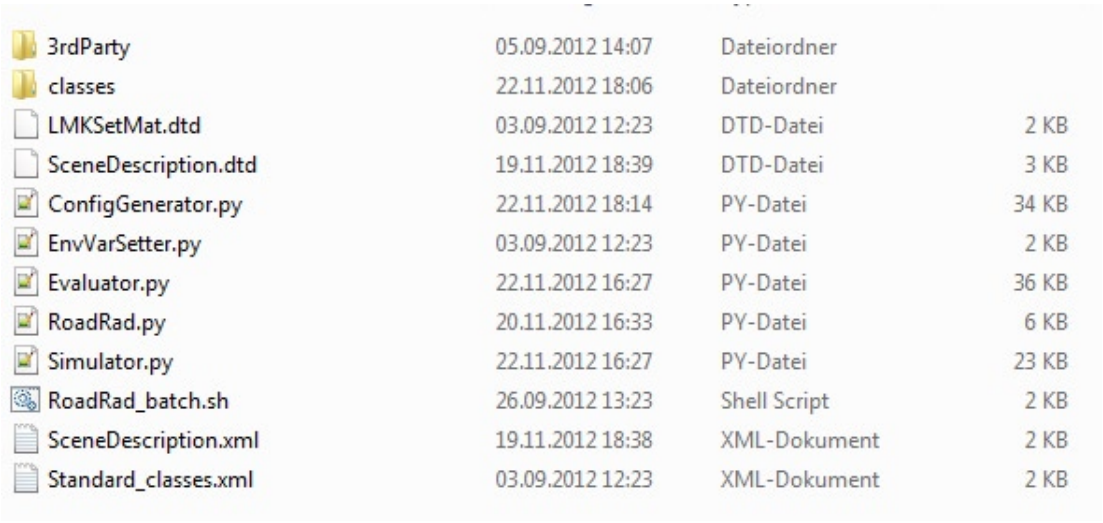

Figure 3.1: Structure of src folder.

All pavement surfaces are stored in the „3rdParty“ subfolder. If you are changing the names, you can not use them in the XML file. The following picture shows the structure and standard given surfaces.

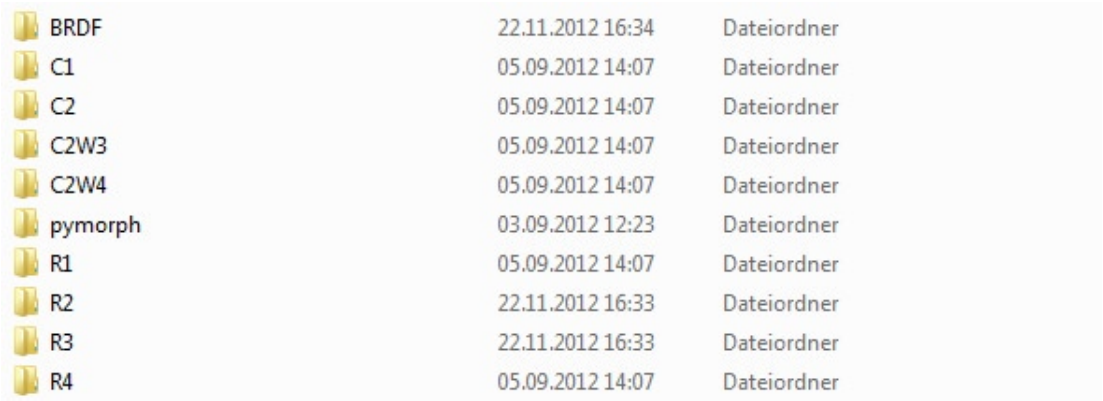

Figure 3.2: Structure of 3rdParty folder.

The last subfolder „classes“ is very important. There are some fixed scene parameters added in the *RoadScene.py*.

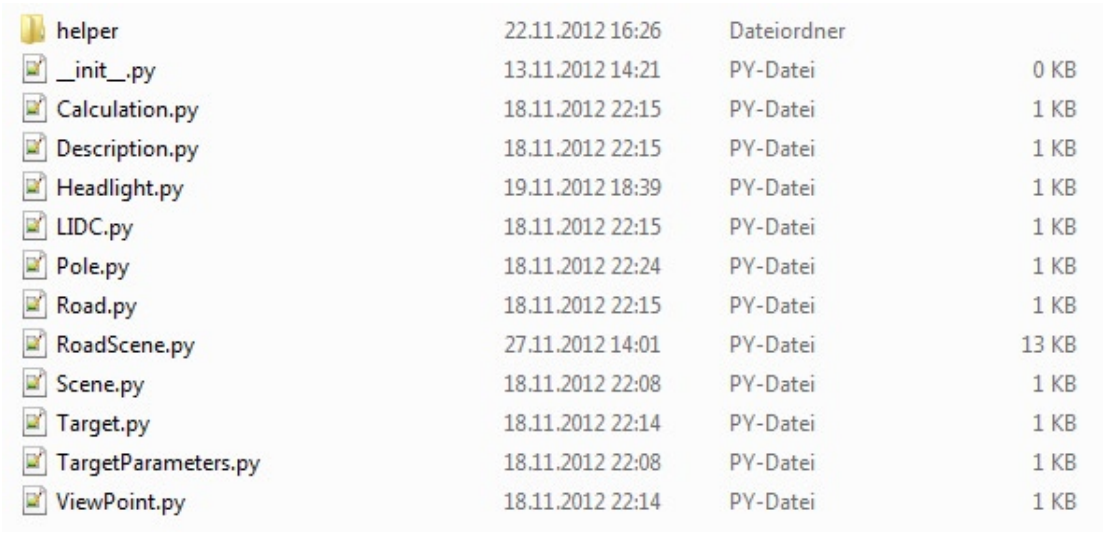

Figure 3.3: Structure of classes folder.

These fixed scene parameters are listed in the following table. You can change them by editing the following files in src-folder and subfolders.

Filename.py	Parameters	Typ	Values	Description
ConfigGenerator	radDirSuffix	String	'/Rads'	folder for saving .rad and .cal files
	lidcDirSuffix	String	'/LIDCs'	folder for searching .ies files and saving .dat files
	rTableDatSuffix	String	'/3rdParty/'	folder for searching r-table files in specific subfolder
	self.xmlConfigName	String	'SceneDescription.xml'	name of the given xml file, if you change, change in Simulator.py and Evaluator.py too!
RoadScene	sceneLength	Float	8000	length of road in m, important for ambient calculation
	sidewalkHeight	Float	0.1	height of sidewalk in m
	markingWidth	Float	0.1	width of dashline in m
	markingLength	Float	0.1	length of dashline in m
	poleRadius	Float	0.05	radius of pole cylinder in m
	numberOfLightsPerArray	Integer	9	maximum number of lights per array
	numberOfLightsBeforeMeasurementArea	Integer	3	maximum number of lights befor measuremnt field
	lidcRotation	Float	-90	rotation of pole lidc in degree
	sensorHeight	Float	8.9	height of sensor in mm
	sensorWidth	Float	6.64	width of sensor in mm
Simulator	horizontalRes	Float	1380	horizontal component of image resolution
	verticalRes	Float	1030	vertical component of image resolution
	makeFalsecolor	Boolean	True, False	switch to turn on or off falsecolor images
	octDirSuffix	String	'/Octs'	folder suffixes for the .oct files
	refOctDirSuffix	String	'/RefOcts'	folder suffixes for the refoct files
	radDirSuffix	String	'/Rads'	folder suffixes for the .rad files

	refPicDirSuffix	String	'/RefPics'	folder suffixes for refpic files
	picDirSuffix	String	'/Pics'	folder suffixes for the pic files
	lidcSuffix	String	'/LIDCs'	folder suffixes for the .ies files
	picSubDirSuffix	String	'/pics'	subfolder suffixes for the .pic files
	falsecolorSubDirSuffix	String	'/falsecolor'	subfolder suffixes for the falsecolor .pic files
	pfSubDirSuffix	String	'/pfs'	subfolder suffixes for the .pf files
	lumSubDirSuffix	String	'/lums'	subfolder suffixes for temp lum files
	LMKSetMatFilename	String	'/LMKSetMat.xml'	name of the LMK Matlab XML file
Evaluator	octDirSuffix	String	'/Octs'	folder suffix for the .oct files
	radDirSuffix	String	'/Rads'	folder suffix for the .rad files
	picDirSuffix	String	'/Pics'	folder suffix for the .pic files
	picSubDirSuffix	String	'/pics'	subfolder suffix for the pic files
	evalDirSuffix	String	'/Evaluation'	folder suffix for the calculation files
	horizontalRes	Float	1380	horizontal component of image resolution
	verticalRes	Float	1030	vertical component of image resolution
	numberOfMeasurementRows	Integer	3	number of measurment rows
	numberOfMeasurementPoints	Integer	10	number of measuremnt point per row

Chapter 4

Start Simulation

To simulate your first scene, make sure, that you have the folder structure from chapter 3 and an execution folder named „scene“. In this folder you can put different subfolders with diffenrent titles, but each subfolder must have a *SceneDescription.xml* and a „LIDCs“ folder with ies-data, if you want to work with them.
Now you can configurate your scene by editing the *SceneDescription.xml* in your subfolder like chapter 2.

```
<RoadScene>
    <Scene>
        <Description Title="LED R1 2070lm 35m VDL" Environment="Grass" FocalLength="25" />
        <Road NumLanes="2" NumPoleFields="1" LaneWidth="3" SidewalkWidth="1" Surface="R1" qZero="0.09" />
        <Calculation DIN13201="off" VeilingLuminance="off" VeilingLuminanceMethod="standard" TresholdLuminanceFactor="7" />
    </Scene>
    <TargetParameters>
        <ViewPoint Distance="60" Height="1.5" TargetDistanceMode="fixedViewPoint" XOffset="0" ViewDirection="fixedRP800" />
        <Target Size="0.3" Reflectancy="0.04" Specularity="0" Roughness="0" Position="Center" OnLane="2" />
    </TargetParameters>
    <LIDCs>
        <LIDC Name="HellaEcoLight_2070lm_LDT" LightSource="LED" LightLossFactor="0.1" SPRatio="1.71" />
        <LIDC Name="HeadLight" LightSource="LED" LightLossFactor="0.1" SPRatio="1.71" />
    </LIDCs>
    <Headlights>
        <Headlight LIDC="HeadLight" HeadlightDistanceMode="fixedHeadlightPosition/FixedTargetDistance" Distance="20" Height="0.7" Width="1.9" Sl
        <Headlight LIDC="HeadLight" HeadlightDistanceMode="fixedHeadlightPosition/FixedTargetDistance" Distance="20" Height="0.7" Width="1.9" Sl
    </Headlights>
    <Poles>
        <PoleArray Height="5.97" Spacing="39.4" Overhang="1" IsStaggered="False" LIDC="HellaEcoLight_2070lm_LDT" Side="Right"/>
        <PoleSingle Height="9" Overhang="-4" LIDC="HellaEcoLight_2070lm_LDT" PositionY="27.7" Side="Left"/>
        <PoleSingle Height="9" Overhang="-4" LIDC="HellaEcoLight_2070lm_LDT" PositionY="-9" Side="Right"/>
    </Poles>
</RoadScene>
```

Figure 4.1: Example of SceneDescription.xml

Now open you terminal and navigate to your src-folder. To start the simulation type in:

./RoadRad.py –dir YourSubfolder

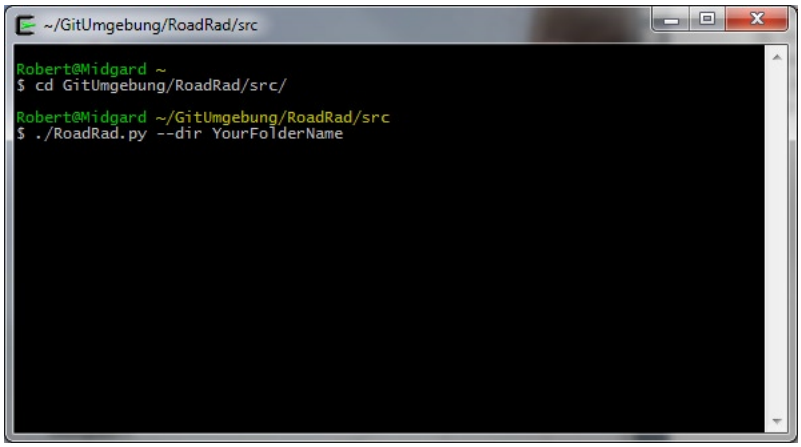

Figure 4.2: Example of SceneDescription.xml

If you want to simulate a lot of scenes, you can use the *RoadRad_batch.sh* in the src-folder. You can edit this file with a normal text editor. Add your folder names to the dirArray devided by space characters and add your working LMK database to the dirOfDatabase. Now you can start your simulation in terminal with:

./RoadRad_batch.sh

```
#!/bin/bash
# start this shell script with ./RoadRad_batch.sh from the src directory

# please add the folder names of your scenes in the following array (devided by space characters):
dirArray=(Yuwen/Scene1)

# please add your LMK database directory:
dirOfDatabase="/Users/sandy/Desktop/Development/LMK/LMK_Data_evaluation/database/Yuwen"

for((i = 0; i<${#dirArray[*]}; i++));
do
    ./RoadRad.py --dir ${dirArray[$i]};
    mkdir -p $dirOfDatabase/${dirArray[$i]}
    cd ..
    cp -R scenes/${dirArray[$i]} $dirOfDatabase/
    cd src/
done
```

Figure 4.3: RoadRad_batch.sh

4.1 Ambient Simulation

After all rads-data are made you have ten seconds time to choose between normal or ambient simulation. If you dont take a choice, a normal simulation will start. If you choose „yes“ for ambient simulation, following *rpict* paramters are used.

ab	aa	ar	ad	as
2	.15	128	4096	1024

4.2 Evaluator