moth version 1 / release 1

Program Documentation

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1. Introduction

Welcome to the first version of moth. moth is a powerful and simple to use triangle mesh editor based on standardized **OpenGL** and **XML** (file format) technologies. Its major field of application is the creation of **3D models for interactive applications** like games, visualizations, simulations, virtual worlds and similar uses.

Another field of application is 3D sketching. If you want a simple tool for working on your design concepts – moth might be worth a look.

moth does not provide sophisticated primitives like splines, nor does it come with elaborate rendering capabilities. It is, in the current version, understood to be a tool for graphics programmers rather than for artists. Or, put some other way, it is a tool for artists given the job to provide programmers with fancy 3D modells for use in a program.

By constituting an easy to use interface between **WYSIWYG 3D modelling** and XML representations of geometry and texture mappings, moth is a versatile tool for cooperations between artists and programmers which way ever it is seen ;)

moth provides **in-detail manipulation of mesh structures**, down to the metal. You can modify vertices, triangles, texture coordinates (a.k.a. UV coordinates) in many ways. If you are acquainted with technologies like VRML or OpenInventor this knowledge will help getting into the concepts of this program quickly. If you are new to 3D modelling, moth is a good starting point, because its simple and does not drown first-time users in huge piles of functions.

The user interface is optimized for modelling speed. However, this comes at the drawback that you must internalize the concepts behind it before you are able to use it. Please read this manual before you get frustrated, because things do not work as you expect them to. If you are the experimental type (like myself) you should at least read the **Getting Started** section. which explains the most important concepts. Having read that section playing around with the program will be a lot more fun – rely on it.

But most important of all.

have fun

Peter Uray, Graz 2005/01

2. Compiling and Installing

For **compiling moth**, you need several things.

- Linux – any decent distribution will do.
- The Gnu C++ development suite – compiler, headers and libraries (packaged with virtually all Linux flavors)
- The libtiff library (get the most recent version or use the one provided with your Linux distribution).
- Qt 3 – the program will not compile with earlier Qt versions!
- A hardware accelerated OpenGL 1.2 implementation. Software implementations like MesaGL will not work.

- libmoth (available at http://moth.titanothere.com/)
- moth (available at http://moth.titanothere.com/)

If you wish to compile the code yourself (recommended) you need the development versions of all the libraries listed. If you want a **pre-compiled executable**, download the linux-elf binary from moth.titanothere.com and skip the compilation procedure.

In order to compile, proceed as follows.

Check that you have the stuff as listed above.

Download the libmoth tarball to your home directory and untar it by typing

```
tar xvzf libmoth_1.0.tar.gz
```

This will create a directory named libmoth_1.0. cd to that directory and type:

```
make ; make install
```

By default, libmoth is installed to /usr/local/lib and /usr/local/include/moth.

IMPORTANT! **You must login as root in order to be able to install the software in a system directory.**

You are strongly discouraged from changing the default install directory in the Makefile unless you know, what you are doing. If you do, please change the MOTH_INCLUDES and MOTH_LIBRARIES variables in the Makefile of moth accordingly.

Once you have the libmoth library installed to a system directory, you may proceed to compiling and installing the modeller. Download the tarball and untar it by typing

```
tar xvzf moth_1.0.tar.gz
```

Again you have to type

```
make ; make install
```

IMPORTANT! **You must login as root in order to be able to install the software in a system directory.**

You are now ready to try out the new installation. Type

```
moth
```

in order to launch the program. If this works, you should be successful. If not, please check back, what you did, and, if this does not help, visit the troubleshooting page at http://moth.titanothere.com/

If you decide to install the **pre-compiled version** please make sure, that you have the runtime versions of Qt3.0.5 and libtiff installed on your systems. You also

need the X11 runtime libraries and a hardware accelerated OpenGL 1.2 implementation.

3. Reporting BUGS

Being a rather new piece of software I expect the existence of numerous bugs. Please use the bug report page at moth.titanothere.com in order to turn them in.

4. Getting Started

In order to get started with moth you must understand a few concepts. The first important concept is, that moth is used on **projects**, not files. Use the *new project* option in order to create a new project. Projects contain scene files and textures in two directories, named scenes and textures. There is no project file – the correct directory structure is sufficient. In order to specify the current project bring up the preferences dialog (File->Preferences) and select the first tab labeled *General*. Klick on the file select button in order to select the desired project directory. The program remembers the project directory persistently until you change to a new one.

moth knows two modes, the **modelling mode** and the **navigation mode**. The regular mode is the modelling mode. If you wish to alter the viewpoints you must change to the navigation mode by holding down the shift button. You can now rotate, scale and move the views by dragging the mouse with the left, middle and right button pressed. Release the shift button in order to return to the modelling mode. If you double click in a view with the shift button pressed, the default camera position is restored – do this when you get lost in your scene.

Please note that the XY, YZ, ZX and texture views cannot be rotated.

Try this:
Hold the shift button, klick into the 3D view and ..
.. move the mouse left and right with the left button pressed in order to rotate the view.
.. move the mouse up and down while holding the middle button (or left and right simultaneously if you have a two-button mouse) in order to zoom the view.
.. move the mouse around with the right button pressed in order to shift the viewpoint.

Navigating through a scene link this requires a little practice, but it is a much faster way to navigate, than using elaborate user interface elements.

All scenes, created with moth are structured into so-called **models**. Models are used for imposing a logical structure on scenes. Models can be compared to layers but are more versatile and powerful. The logical structure of the current scene is visualized in the structure view to the left. When you start with a new file, there is only one node, the scene node. Klick on it with the right mouse button in order to bring up the **context menu** of this node. Select the option *Add Model*. This adds a model to your scene tree. Klick on the model node and select *Create Shape -> Sphere*. Accept the parameters as they are (just for trying it out) and you have added a spherical **shape** to your model. Shapes are arbitrarily shaped, textured triangle meshes. All scenes are composed of models, shapes and light sources.

You can select four types of appearance for shapes and models by clicking on the item's appearance with the right mouse button (brings up the context menu) in the structure view. Try changing the appearance of your sphere to *wireframe*.

When you select the sphere shape (NOT the model) you will notice that there appears a multicolored coordinate cross with a red, a green and a blue handle in the model views. This is the **shape manipulator**. It serves as handle for most transformations you can apply to shapes. There are two groups of **transformations**:

Rigid transformations (translation, rotation and scaling) can be applied to models, shapes and light sources. Note that scaling a light source has no effect.
Vertex transformations can only be applied to shapes as the other elements of the scene graph do not contain vertices.

The transformation types are selected using the state buttons in the top icon row. All buttons have **tooltips**, which tell you what they do, when you move the mouse pointer over them. Select the sphere for trying it out. Click on the button (the arrow cross) labeled (tooltip) *move* in order to select the corresponding rigid transformation. Now click on the blue square at the end of the manipulator's blue part with the left button. Move the mouse **left and right** while holding the mouse button. The sphere should be moved up and down. By klicking on the manipulator's ends you confine a transformation to a particular axis. Try moving the sphere in the X and Y direction by clicking on the red and green ends.

As a general rule of thumb, when applying transformations using the manipulator, you change a single value – in the above example, say, the x-coordinate of a shape's position. Moving the mouse to the right increases the value, moving it to the left decreases it. Thus, when viewed from behind some changes may appear to go into the false direction, but this is an effect of your viewpoint (from behind), NOT a bug!

moth uses a simple color coding for the three space axes:
X-axis – red
Y-axis – green
Z-axis – blue

By klicking on a manipulator handle with the right mouse button, you transform the manipulator without transforming the associated object. Thus you can, for example, select the origin of a rotation. Try moving with the right mouse button.

The vertex transformations are described in more detail in the mesh editing section below.

5. Projects

As already mentioned in the *Getting Started* section, moth works on projects. A project is nothing but a directory, containing (at least) two subdirectories named *scenes* and *textures.* Whenever you load or save a scene , the file dialog will automatically start in the current project directory as specified in the program settings (see below).

When you load a scene, the current scene is not discarded. Instead, the models

and light sources contained in the loaded scene are added to the current scene. This allows for the creation and effective use of model libraries in a most simple and straightforward way. Create a folder labeled models (or which name ever you prefer) and fill it with scenes containing the models you need (e.g. houses, trees, ...). In order to compose a scene from these archived models, simply load the models you need, one after the other, and use them.

If you wish to clear the scene graph, you should use the *New Document* icon. Do not forget to save your scene, if you want to keep it, as the data contained in the scene graph will be destroyed by this operation.

You can easily create a new project by using the *File->New Project* menu item. When selecting this function, a file dialog pops up. Select an existing directory, or create a new one using the create directory button, and select it. By clicking the OK button, the appropriate directory structure (including a models directory for your model library) is created and the new project directory is made the current project dir.

6. Program Settings

The first thing to be done after starting a new project is the adjustment of the Preferences. Select *File->Preferences* or press *CTRL-P* in order to bring up the Preferences dialog. Most of the labels are self-explanatory. A brief description of each value is given below.

General:	
Undo Steps	The number of undo steps (min: 1, max: 100) The more undo steps you specify, the more memory is required.
Project Directory	The directory containing the scenes and textures of the current project.
Grid/Units:	
Grid Position	The origin of the grid (NOT of the global coordinate axes). The grid is the white mesh of squares which, by default, indicates the XY plane. The grid position defines the third coordinate in the XY, YZ abd ZX views.
Grid Spacing	The grid spacing is the distance between the grid lines
Snap Spacing	The distance between the snap points. Remember that you must check the snap points option for these values to have an effect. The snap points define the snapping grid.
Snap Angles	When you enable the snap angles option, rotation angles are multiples of these values. By default, rotations are applied in steps of 5 degrees.
Show XY/YZ/ZX Grid	Check these boxes in order to show or hide the grids.
Display Axes	Check this box in order to show/hide the coordinate axes.

Snap Points	Use this box in order to enable/disable snapping. Please remember to disable this option when you find that smooth surfaces become jaggy by transformations.
Snap Angles	Use this box to enable/disable angle snapping.
Grid Size	The size of the grids (all three grids must have the same size).
Texture Grid Size	The size of the texture grid (the grid which is visible in the texture view).
Camera	
Opening Angle	The opening angle of the camera in the perspective (3D) view.
Near Clipping Distance	The near clipping distance of the perspective camera in the 3D view.
Far Clipping Distance	The far clipping distance of the perspective camera in the 3D view.
Default Radius, Phi, Theta	The default camera position is assumed when you hold the shift key and double click in the 3D view. These numbers describe this position in spherical coordinates. The camera always looks at the world - origin.

7. Views

moth provides six different **modelling views**. The 3D view displays a perspective view into the scene. The XY, YZ and ZX views display isometric views using the XY-plane, the YZ-plane and the ZX-plane as projection planes. The so-called quad view provides a simultaneous display of 3D, XY, YZ and ZX view. Finally, the texture coordinate view displays and allows for manipulation of the texture coordinates (UV coordinates).

The scene's logical structure is displayed in the **structure view** – the left column. You will have noticed already, that moth does not provide many menus when started. This is, because all menus are context dependent. There is a menu for scenes, one for models, one for shapes and so on. **You can access the menu for a particular scene element, by klicking on its icon (or name) with the right mouse button.** All function are context sensitive, so you simply cannot apply pointless functions – this does not mean that you cannot apply functions pointlessly, so take care!

8. Navigation

As already mentioned in the getting started section, there are two modes. The **modelling mode** is used for changing scenes. There is nothing you need to do in order to get into this mode. The **navigation mode** is in effect whenever you hold down the shift key. The best way of moving through a scene is by using a three button mouse - generally a handy item when using X. If you do not have a 3 button mouse, try pressing the left and right button simultaneously. This feature is called the emulate 3 buttons option (make sure that it is enabled on your

system).

The left button is used for rotating the view, the middle button is used for zooming in and out and the right button moves the view. It requires a little practice to use this kind of navigation, but it is a fast way of changing the viewpoint – which is important when you create more elaborate models and scenes.

The selection of scene items is best done in the structure view. In order to make this fast and simple you are strongly advised to endow your objects with clear, self-explaning names. You can change an item's name by clicking on its name while it is selected.

The selected item displays its manipulator – which also serves as a visualization of the item's local coordinate system - in the 3D, XY, YZ and ZX views.

Models can also be selected by entering the select mode and subsequently klicking on the item in one of the geometry views (not the texture view). If you miss, the currently selected item is unselected – i.e. you can unselect items by klicking someplace outside your scene.

9. The Scene Graph

Models, shapes and light sources are the ingredients of scenes. This section gives a detailed description of these items and which functions and transformations can be applied to them.

The Scene
The scene is always the top node in the structure view. There can be only one scene per program instance. There are no transformations available for the scene. However, there is a context menu providing several functions.
In order to bring up the scene context menu, you need to click on the scene node with the right mouse button. The following functions are available:

Add Model	Adds a new model to the scene. Remember, that you need at least one model because there is no possibility to create shapes outside of models.
Add Light Source	Adds a new light source to the scene. Lights which are contained in the scene node act on all models and shapes.
Paste	Pastes a previously copied or cut item. The attempt to paste a shape to the scene node has no effect.
Expand	Expands all model nodes contained in the scene.
Collapse	Collapses all model nodes contained in the scene.
Global Illumination	Specifies a global illumination. The global illuminations is purely ambient.
Global Background	Specifies the background color for the 3D view.

Models

Models are structuring elements which may contain light sources, shapes and other models. We encourage the extensive use of models for organizing large scenes, as a well-pondered structure makes the manipulation of scenes a lot easier.

Models can be selected and rigidly transformed. No vertex manipulations are available for models. Use the icon buttons in the icon bar in order to select the transformation you wish to apply.

In order to bring up the model context menu, you need to click on the model node you wish to affect with the right mouse button. The following functions are available:

Add Model	Adds a new model to this one
Add Shape	Adds an empty shape to the model. Empty shapes are shapes which do not contain vertices or facets
Add Light Source	Adds a new light source to the model. Light sources contained in a model affect all shapes and models contained in this model, but no others.
Cut	Copies the model to the clipboard and deletes it. A cut model can still be pasted somewhere else.
Copy	Copies the model to the clipboard
Paste	Pastes the item on the clipboard to the model. If the item on the clipboard cannot be pasted, this function has no effect.
Clone	Creates an exact copy of this model.
Expand	Expands the model node, so one level of sub-items becomes visible in the structure view.
Collapse	Collapes all item nodes of this model
Create Shape	Creates one of the shapes listed in the sub menu.
Set Position	Specifies the position of the model. A dialog for entering the coordinates pops up.
Move	Moves the model by the vector to be entered in the appearing pop up dialog.
Rotate	Rotates the model around the X, Y and Z axes by the angles to be entered in the appearing pop – up dialog.
Scale	Scales the model by the factors to be entered in the appearing pop-up dialog.
Mirror	Mirrors the model with respect to the axis to be entered in the appearing pop-up dialog.
Function	Applies the function to be selected in the appearing sub menu.

The functions act as follows:

Snap Position	Snaps the model's position to the closest grid point.
Align Direction	Applies a rotation, such that the model's local X-axis is aligned with the global X-axis (both red axes point into the same direction).
Align Up	Applies a rotatione, such that the model's local Z-axis is aligned with the global Z-axis (both blue axes point into the same direction)

Hint: Subsequently applying the functions Align Direction and Align Up aligns the entire local and global coordinate systems.

Shapes

Shapes are arbitrarily formed, textured triangle meshes. Shapes are constituted of vertices (visualized as red points), triangles (visualized as white triangles in the appearance wireframe) and texture vertices (visualized as red points in the texture view). moth knows no other geometric primitives but triangle meshes. You cannot create a sphere (or any other primitive). All you can do is create a triangle mesh that approximates a sphere more or less accurately, depending on the parameter values specified.

When you click on a shape node in the structure view with the right mouse button, the shape's context menu appears. The following functions are available:

Add Light Source	Adds a light source to the shape. Light sources which are contained in a shape, do not affect other items.
Assign Material	This option brings up the material dialog. See the section on materials and textures for details.
Cut	Copies the shape to the clipboard and deletes it.
Copy	Copies the shape to the clipboard without deleting it.
Paste	Pastes the object on the clipboard. If the object does not fit, this function has no effect.
Clone	Creates an exact copy of this shape.
Declare Master	Makes this shape the master shape. See the section Creating a simple scene for details on using the master option.
Clear Master	Clears the master shape. If no master is active, this function has no effect.
Set Position	Specifies the shape's position.
Move	Moves the shape relatively by the vector to be specified.
Rotate	Rotates the shape around the X, Y and Z axes by the angles to be specified.
Scale	Scales the shape by the factors to be specified.
Mirror	Applies a mirroring transformation.
Function	Brings up the shape function menu.

The shape function menu contains many additional functions which can be applied to shapes:

Merge Down	Merges the shape with the one directly below in the scene graph. The shape's material is erased.
Remove Facets	Removes all facets, containing three selected vertices. In order to remove a triangle, select all three vertices defining it and call this function.
Remove Degenerate Facets	Removes all degenerate facets (facets with two or three equal vertices).
Remove Unused Vertices	This function removes all vertices that are not used by at least one facet.
Remove Unused Texture Vertices	This method removes all texture vertices which are not used.
Homogeneous Orientation	This method attempts to choose the orientations of all facets such that the resulting mesh is homogeneously oriented. Use this function if shaded surfaces look somewhat strange or inconsistent. Note that the homogenization problem is not always defined.
Revert Orientation	Reverts the orientation of all facets
Texture Projection	Projects the vertices of a shape to the XY plane and uses the resulting vertices as UV coordinates. See the section Creating a Simple Scene for an example of this procedure.
Clear Texture Mapping	Removes all texture vertex definitions. Watch out! loosing the texture definition might not be what you really want.
Clone Selected Vertices	Creates a new shape containing copies of the selected vertex set. This function is there for creating transitions.
Snap Vertices	Snaps all vertices to the closest grid point.
Snap Position	Snaps the shape's position to the closest grid point.
Align Direction	Aligns the shape's direction (the local X-axis) with the global X-axis.
Align Up	Aligns the shapes up vector (the local Z axis) with the global Z-axis
Elevate	Creates a shape from elevating the vertices contained in the selected shape along the Z-axis.
Sweep Rotate	Creates a sweep object by rotating the vertices contained in this shape around the Z-axis
Jitter	Adds noise to the Z-coordinate of each vertex.

10.Light sources

In moth light sources are OpenGL light sources. Following the OpenGL standard, a total maximum of eight lights sources can be active simultaneously. This does

not mean, that you cannot have more than eight light sources in one scene, only that you cannot use a larger number of lights simultaneously.

Light sources affect only items, they are contained in. If you add a light source to the scene node, it will affect all models and shapes contained in the scene. If you add a light to a particular model, all models and shapes contained in this model are affected, whereas other models are not. If you add a light source to a shape, only this shape is affected. In order to achieve a consistent appearance of illumination, light placement should be well thought of.

Light sources are handled by the scene graph. Since the total number of lights is limited by the OpenGL standard, unused light sources are released (returned to OpenGL, so to say) by the scene graph automatically.

Add a light source to a model or shape, by selecting the appropriate menu item. Once a light source has been added to the scene graph, you can modify its properties. As always, you need to click on the light source item in the structure view with the right mouse button in order to show the light menu.

The following functions are available:

Cut	Copies the light to the clipboard and removes it from the scene graph.
Copy	Copies the light to the clipboard.
Clone	Creates an exact copy of a light source.
Set Parameters	Brings up the dialog for setting the light source parameters, e.g. colors, attenuations and such.
Set Position	Allows for entering the light source's position.
Move	Moves the light by the vector to be entered into the appearing pop up dialog.
Rotate	Rotates the light source around the X, Y and Z axis by the angles to be entered into the pop up dialug.
Functions	The functions menu.

The functions menu provides only two functions: Snap Position (snaps the light's position to the closest grid point) and Align Direction (aligns the light's local X-axis with the global X-axis). There is no function for aligning the up vector, because lights are always symmetric with respect to rotations around the (local) X-axis.

11.Materials and Textures

Every shape has a material and a texture. Of course, you may render a shaded versoin of a shape, but there is always a texture – even though the default texture is small (16x16) pixels and shared by all shapes using it, so it will not consume a lot of your memory. You can show the material dialog by selecting the option assign material in the shape's context menu. The changes you make take effect immediately, so you can interactively modify the appearance of a shape.

Try this:

1. Start a new scene.

2. Add a model to the scene.
3. Add a sphere to the model.
4. Add a light source to the model, move it to a reasonable position and rotate it, so that it points towards the sphere.
5. Bring up the material dialog and modify the material. Watch the sphere's appearance change when you modify the material settings. If you have texture files in your project's texture folder, you may specify a texture for the sphere. However, please make sure that the sphere's appearance is set to textured, otherwise you will not see the texture.

Please note, that only textures which are contained in the textures directory of the current project can be used.

IMPORTANT! Textures must be .tif files and their extensions (width and height) must be powers of 2. This is a result of a restriction to OpenGL. The allowed values for a texture's width and height are: 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024. Larger values may be used as long as they do not overflow the texture memory of your graphic card – which is stronly recommended to avoid. You may use various .tif formats, as long as the image representation is understood by libTiff. If in doubt, make sure, that your image has the correct size and simply try it out. A good tool for creating and storing textures in the appropriate .tif format is the GIMP (http://www.gimp.org/).

Textures may contain an alpha channel, which is also supported by moth.

12.Mesh Editing

Once you are capable of adding models, shapes and light sources and of changing their properties, all that remains to learn is, how to edit the meshes using moth. Before we start with the transformations provided, we will shortly explain, how meshes are represented by the scene graph.

A mesh is represented by vertices, facets texture vertices and texture facets. Vertices are points in 3D space. Facets are tripples of indices which indicate the points spanning the triangle. Texture vertices (UV coordinates) are points in the image plane (2D). Finally, texture facets are index tripples connecting texture vertices. If you have knowledge about XML and the representation of 3D data, view a simple .mscn file with a text editor. The structure is quite straightforward.

In order to **add vertices** to a shape, you have to use the vertex creation tool in the vertex transformation toolbar.

Try this:

Add a model to the scene. Then add an empty shape to this model by choosing the menu item *Add Shape* in the model's context menu. Select the vertex creation tool and use one of the plane views (XY, YZ or ZX) in order to add some vertices to the shape. You cannot add vertices in the 3D view. Vertices are always placed on the grid, thus, if you change the grid's position you also change the planes for vertex placement. For example if you change the grid position to (0, 0, -2) and you use the XY view for inserting vertices, the newly created vertices will be given a z-coordinate of -2 because this is the grid's z-position. The same works for the other views with the corresponding coordinate values.

Once you have added at least three vertices to a shape, you may connect

them into triangles. Select the *Create Triangle* tool and **create a triangle** facet by selecting the vertices you wish to connect.

In some cases it is important to flip a triangle edge. For example, lighting may become smoother when the meshing is changed. Use the **flip edge** tool for flipping an edge. Once you have selected the tool simply click on the pair of vertices defining the edge to be flipped. If your input does not make sense, nothing will happen. Flipping edges is best done in the appearance wireframe.

In order to **move, rotate and scale groups of vertices**, use the **vertex selection** tool for selecting and unselecting vertices. Klick on the vertices you wish to select with the left mouse button – right button for deselecting. If you hold the Crtl key while selecting and deselecting, the changes you make are added to the current selection.

Once you have selected a group of vertices, you may move, rotate and scale them using either the plane views or, in 3D, the shape manipulator like you did with rigid transformations.

13.Creating A Simple Scene

This section is dedicated to an extended example – we will create a rather simple scene containing a house and a few boulders on a simple terrain patch. Let us assume that you have created a new project directory for the example which is already set as the current project. The first thing we will do is copy textures to the textures directory. In order to keep this example simple, we will stick to only a few textures. Use the sample textures available at moth.titanothere.com for this example.

Terrain

The first object we will create is a textured terrain patch. In order to do so, add a model to the scene and name it *terrain*. Then create a plane with the following parameters:

X-Tiles:20

Y-Tiles: 20

X-Size: 50

Y-Size: 50

U-Size: 10

V-Size: 10

Also add a light source and change the material and light source parameters in order to make the plane appear green. Use the material noise.version01.tif as a nice grass texture.

Now lets create some noisy terrain. select the Jitter function from the shape's context menu and apply it with a strength of 2.0. The plane now looks like a hilly landscape. In order to build a house somewhere, we need a planar part in the middle. Select all vertices around the origin (say 3 vertices to each side). Then use the scale vertice stool in order to push all vertices down to the XY plane. Use the Z-part of the plane's manipulator. Now use the Move Vertices tool in order to elevate the selected vertices to the z-level you see fit. All this requires a little

practice, so do not get frustrated if it does not work for the first time. If you have done all this, you have constructed a textured landscape patch with a plane part in the middle to build a house on.

House

For the scope of our example we will keep the house simple, just four walls and a roof. In order to get rid of the terrain (at least for the moment) we set its appearance to invisible. Klick on the terrain model node in the appearance column with the right mouse button in order to get to the appropriate menu.

Add a model to the scene and label it "house". Add a new shape to the house model and label it "walls" Then use the XY view in order to add vertices and triangles to the shape according to figure 13-1

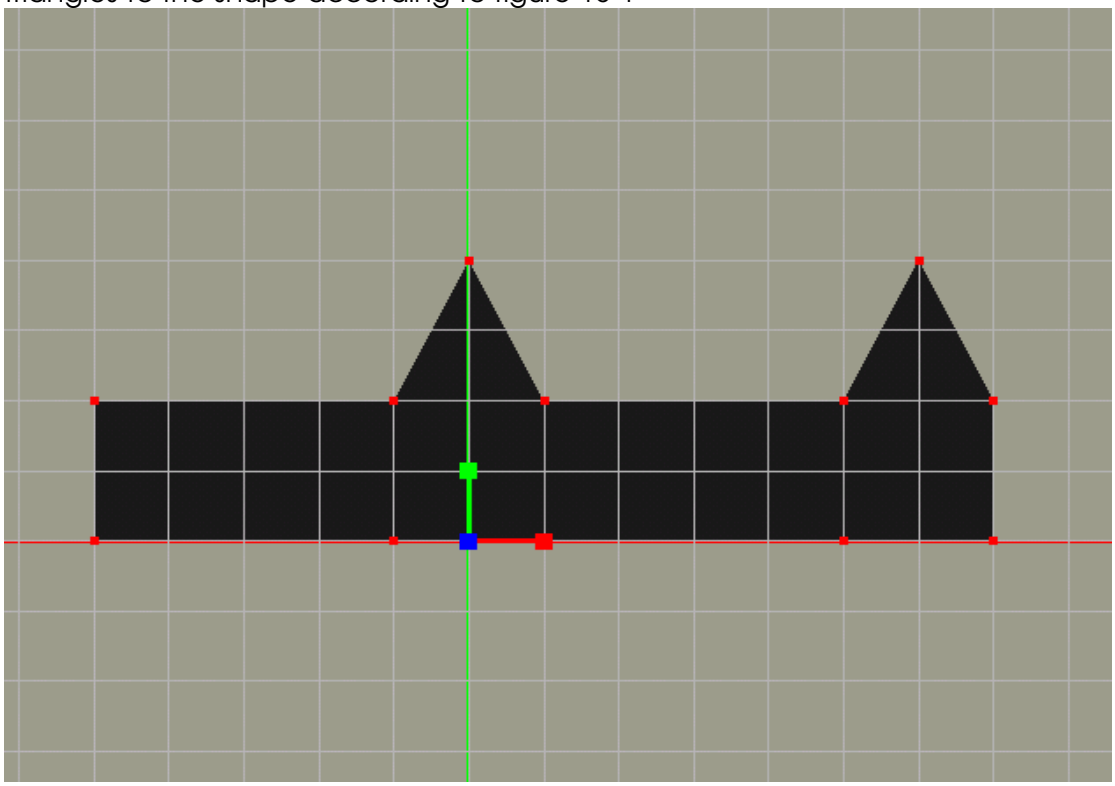
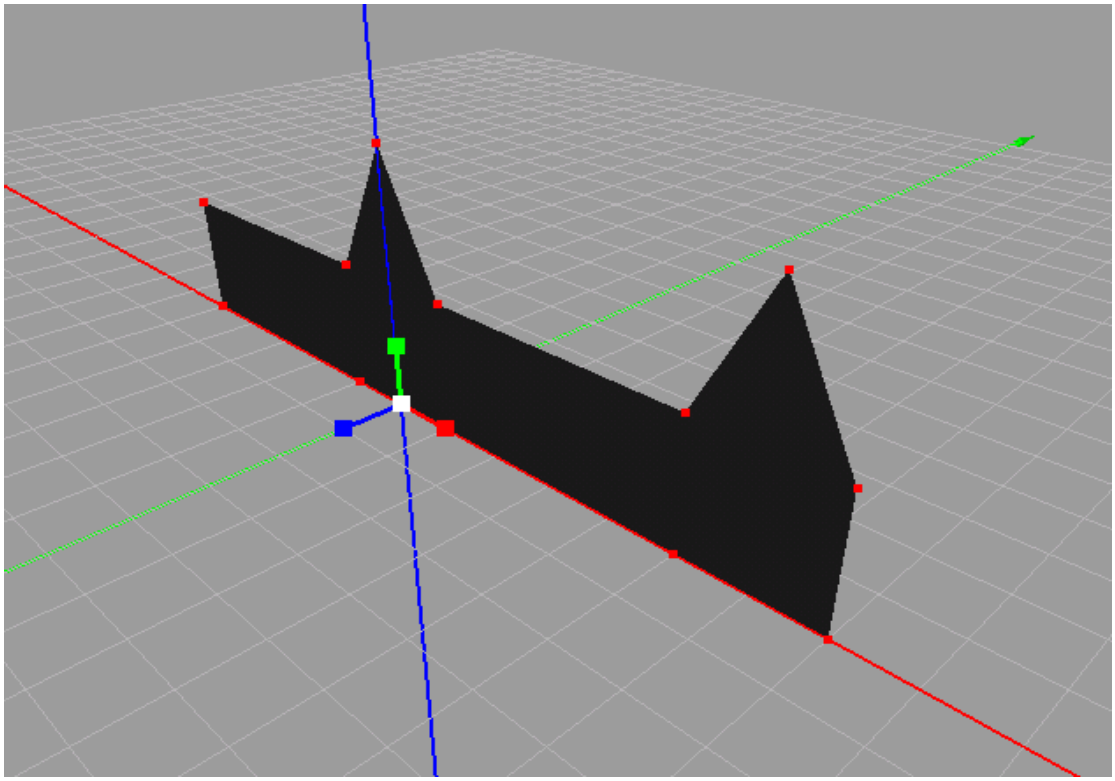


Figure13-1: The outlines of our house's walls in the XY-plane. This stadium is the one for creating the texture coordinates.

Once the walls are created, use the Texture Projection function in order to create the texture mappings. Then rotate the walls shape 90 deg. around the X-axis and fold the house walls according to figures 13-2 and 13-3

Figure 13-2 The wall outlines are rotated to an upright position.



You can fold the shape using the vertex selection, move and rotate tools. Note that you must move the manipulator in order to rotate the vertices around the right axis.

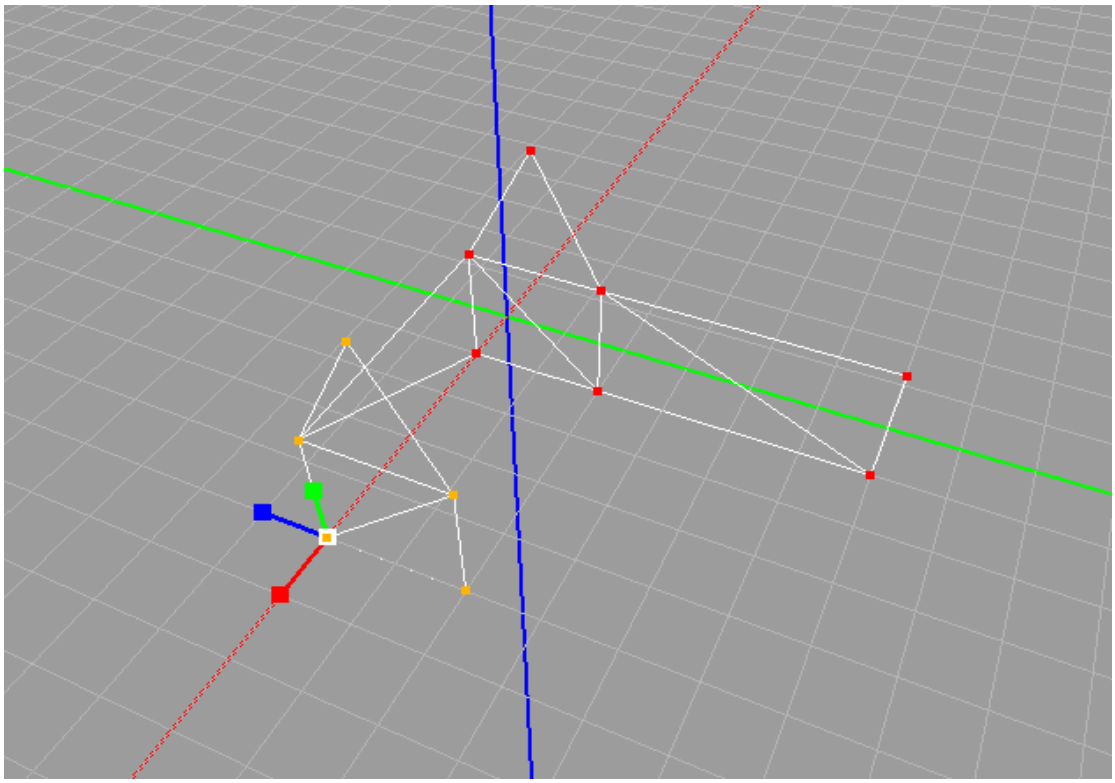


Figure 13-3: Folding the walls. Please note the role of the shape manipulator as the element defining the center of rotation and the axis.

Finally, select the top vertices, and call the "Clone selected vertices" in order to create the boundary of the roof. Change the name of the newly created shape to roof. Finally add the required triangles and project the texture in order to obtain a reasonable UV mapping. Assign materials and textures as you wish.

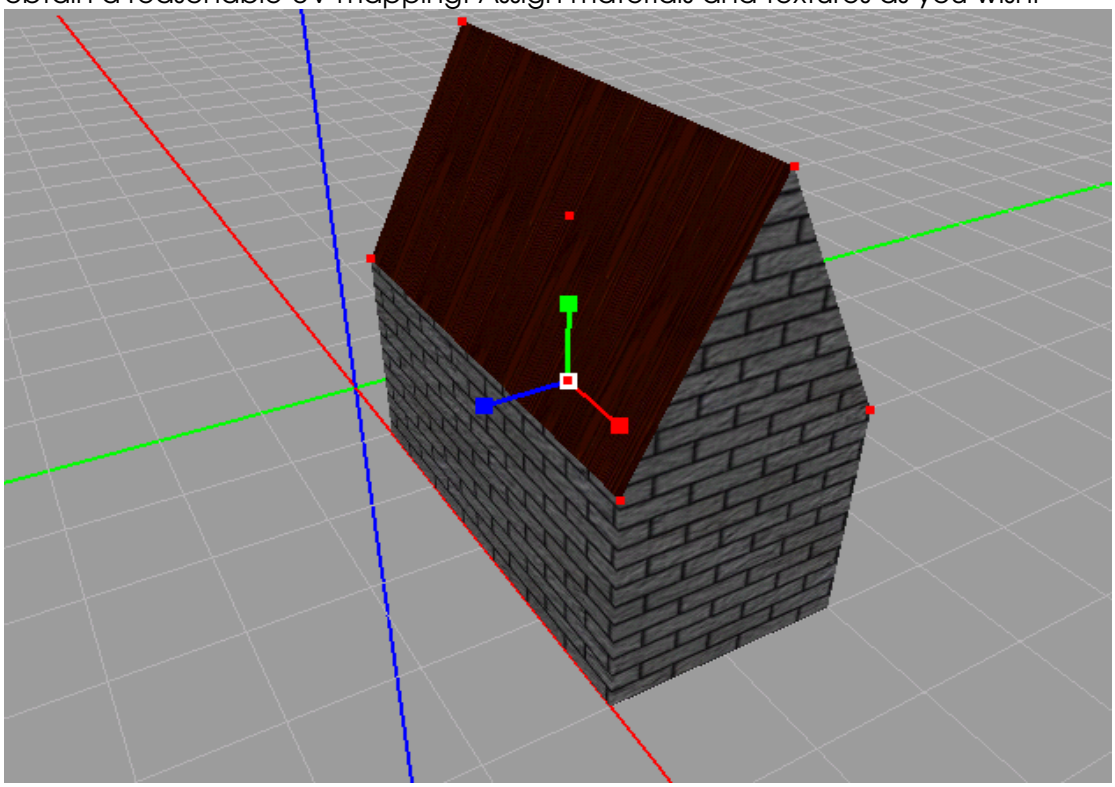


Figure 13-4: The final house model including a roof.

Change the terrain appearance to textured again, and position your house wherever you want it to sit.

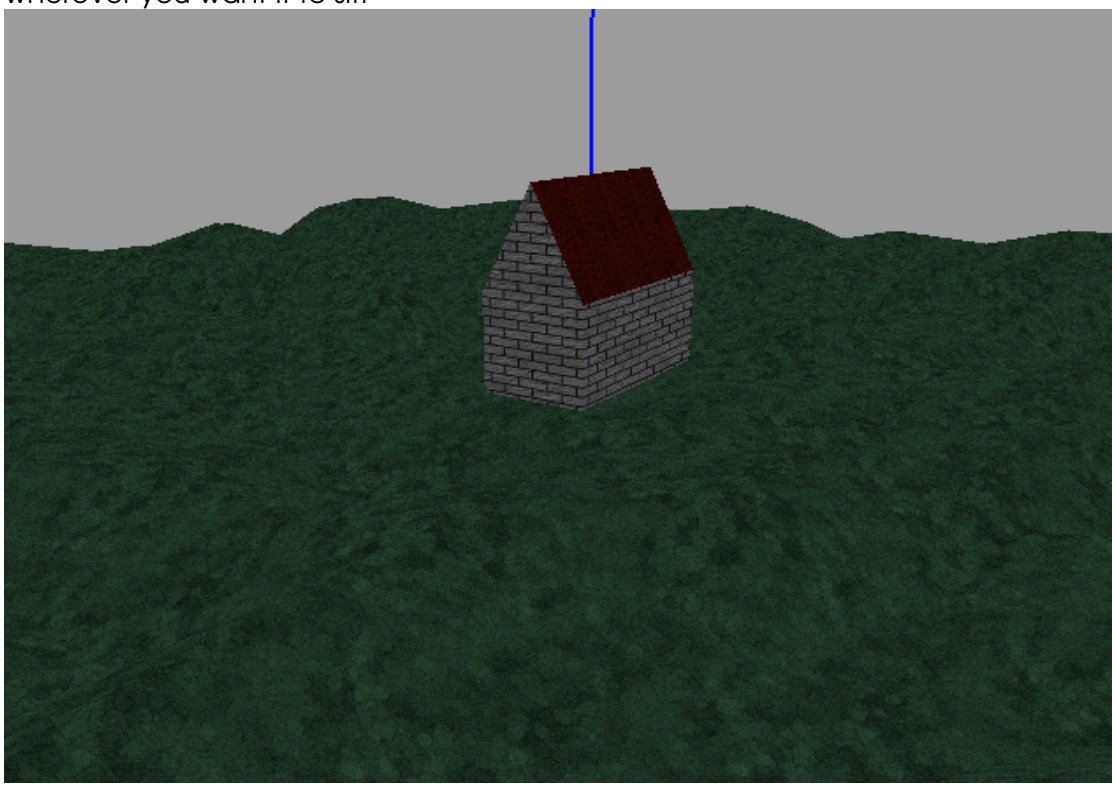


Figure 13-5: The final scene. Simple, but easily created.

Please be aware that this example is reduced to the most simple modelling techniques for simplicity. A fancy model of a house would require a lot more details than the one we built.

14.Data Representation and Files

moth stores scenes as XML files. This section provide a detailed description of the file format for software developers who need this. There is no need to read this section, if you just wish to use the program for modelling. Please note, that the library libmoth provides methods for parsing scene files, so you do not have to write your own parsers unless you have some personal need for it.

The table below along with the descriptions of the CDATA (see below) should be sufficient for implementing a full-featured .mscn parser. In order to fully understand this table, you need a detailed knowledge of OpenGL and XML programming. You may well skip this section, if you do not wish to write some code yourself.

Tag	Parameters	CDATA	Contains
<moth>	none	none	<model> <light>
<model>	name	none	<model> <shape> <light> <pos> <dir> <up> <rm>
<shape>	name	none	<light> <material> <pos> <dir> <up> <rm>
<light>	name	none	<amb> <dif> <spe> <pos> <dir> <up> <spot>

Tag	Parameters	CDATA	Contains
<material>	none	none	<sm> <col> <amb> <dif> <spe> <emi> <shi> <tex> <trans>
<pos>	none	The whitespace separated x, y and z coordinates of the position	none
<dir>	none	The whitespace separated x, y and z coordinates of the direction	none
<up>	none	The whitespace separated x, y and z coordinates of the up vector	none
<rm>	none	The appearance: 1 – textured 2 – shaded 3 – wireframe 4 – invisible	none
<amb>	none	The 4 ambient components	none
<dif>	none	The 4 diffuse components	none
<spe>	none	The 4 specular components	none
<spot>	none	The 5 spot parameters of a light source. Sequence: Exponent Cutoff Constant Attenuation Linear Attenuation Quadratic Attenuation.	none
<sm>	none	The shading mode 1-flat 2-smooth 3-metallic	none
<col>	none	The rgba color values. The color is not used by libmoth.	none

Tag	Parameters	CDATA	Contains
<emi>	none	The 4 emission components.	none
<shi>	none	The shininess value	none
<tex>	none	The name of the texture file used or none if no texture is used.	none
<trans>	none	A flag indicating whether a shape has a translucient component or not. Shapes with transluciency should be rendered in a second pass.	none.

15.Modules Interface

Future versions (starting with release 2 of the first version) of moth will provide a standardized interface for user-implemented extensions, so called modules. Being purely XML based, the module interface is currently being designed to be language independent, so there will be a rich field of activity for module programmers using perl, python, php, C/C++ or any other decent language. Hang on.

16.Data Import and Export

Currently, no data conversion capabilities are implemented. So, moth only understands its own, native XML-based file format. However, the upcoming release 2 which will already implement the module interface, will come with a selection of import and export capabilities. So, hold on for a short while.

17.Conclusion and further developments

This manual is far from being a complete description of moth. It is left to the users to find out and discuss advanced techniques and features with others. Please visit the web site:

http://moth.titanothere.com/

in order to get the latest info.

The upcoming release 2 will provide bug fixes and the modules interface. If you wish to use this program, please take an active part in the further developments. See the web site about info what you can do.

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