

Palm Parameters

Basics about Palms

Palms have a number of characteristics that make them different from broadleaf and conifer trees. In order to help you out in better understanding of the palm model and to facilitate learning process, we have found it necessary to present a brief summary of those principal characteristics of palms that are important for modeling.

The principal elements of a palm are:

1. Roots
2. Trunk
3. Crownshaft
4. Leaves
5. Inflorescence and flowers
6. Fruits

Out of these six elements, you can model the trunk, crownshaft, and leaves in the current version of the palm model so we will concentrate on these elements.

Trunk

The trunk is the most dominant element of a palm and may look very different in different species. It varies in length and width from very short and robust all the way to very long and slender. The short and robust trunks tend to grow upright, and the longer and slender trunks may be inclined and usually curve in a variety of ways. Curving of the trunk varies considerably even in the palms of the same species. In some species, the trunk is swollen to various degrees due to the swelling of cells which expand by the uptake of water. Some palms do not have the trunk above the ground. Their leaves seem to grow directly from the ground.

The surface of the palm trunk may be smooth, ringed in various degrees of roughness, and with the old leaf bases attached. In ringed trunks, the rings, which are the scars of the fallen leaves, may be more or less pronounced. The distance between the rings varies in different palms and may even vary on the same palm depending on the pattern of palm growth. The trunk surface may be covered with the fibers from the bases of fallen leaves, or there may be spines protruding from the old leaf scars.

Crownshaft

In some palms, the trunk carries a cylinder called crownshaft which is composed of tightly packed, tubular leaf bases and it protects the meristem. The color and surface of the crownshaft may vary in different species. The

crownshaft is most often bright green, but it may be tinged with shades of red or yellow. The surface may be smooth, or covered with spines or hair.

Leaves

A palm leaf grows from the trunk. The principal elements of the leaf are: the stem and the leaflets. The stem has two parts which are called the petiole and the rachis. The petiole is the part between the stembase (or leafbase) and the point where the first leaflet is attached to the stem. The rachis is that part of the stem with the leaflets. The leaflets are the divisions of the leaf. They vary in length, number, spacing and arrangement, and in color and form. Some are short and stiff, and some long and slender. Some are straight, and some are curved. Some are wide and soft, and some needle-like and thin.

Palm leaves are classified into two types: pinnate (or feather-shaped) and palmate (or fan-shaped). In pinnate leaves, the leaflets are attached to the stem at intervals. In palmate leaves, the leaflets (called segments) fan out from the end-point of the stem.

For more information on palms, you may consult the following books:

Blombery, A., and Rodd, T. An Informative, Practical Guide to Palms of the World. London: Angus & Robertson, 1992.

McCurrach, J.C. Palms of the World. Stuart, Florida: Horticultural Books, 1970.

Krempin, J. Palms & Cycads Around the World. Broadbeach Waters, Australia: Krempin Books, 1993.

Meerow, A.W. Betrock's Guide to Landscape Palms. Coper City, Florida: Betrock Information Systems, 1992.

Trunk Parameters

Random Seed sets the randomization pattern for trunk parameters. On double click the Random Seed button, the following dialog box appears:

check boxes in the dialog allow you to randomize corresponding trunk parameters selectively. For example, if you check the Trunk Height check box, each subsequently generated instance of the palm will have slightly different height of the trunk.

Equalize Random Seeds equalizes the values of random seeds for the trunk, stems, and leaflets. If you want to change random seeds for the trunk, stems, and leaflets selectively, you will leave this check box unchecked.

Trunk Height sets the height of the trunk. On double click the Trunk Height button, the following dialog box appears:

in. segment length sets the longitudinal resolution of the trunk. If you are concerned about the number of polygons, you may set the minimum length of the segment to, for example, 10 cm or more. For the best quality, the minimum segment should be 5 cm or less.

Auto segment length activates or deactivates automatic segmentation. If activated, TREE will vary lengths of the segments depending on the curvature of the trunk in order to give you the best resolution quality for the minimum number of polygons. If automatic segmentation is deactivated, all segments will have the same length set by the Min. segment length.

Trans. resolution sets the number of polygons (transversal resolution) for each cylindrical segment of the trunk.

Model check box allows you to choose whether to model or not to model the trunk.

Trunk Width allows you the access to the parameters that enable you to mold the trunk form. Trunk Width button brings up the following dialog box:

Regions along the trunk defines the positions of six, characteristic widths along the trunk. Width values sliders allow you to set these six, characteristic widths. Each width value and its corresponding position are designated by the same color.

Equalize trunk and crownshaft width check box equalizes the top width of the trunk with the bottom width of the crownshaft.

Min. segment length sets the longitudinal resolution of the trunk. If you are concerned about the number of polygons, you may set the minimum length of the segment to, for example, 10 cm or more. For the best quality, the minimum segment should be 5 cm or less.

Auto segment length activates or deactivates automatic segmentation. If activated, TREE will vary lengths of the segments depending on the curvature of the trunk in order to give you the best resolution quality for the minimum number of polygons. If automatic segmentation is deactivated, all segments will have the same length set by the Min. segment length.

Trunk Angle sets angle of the trunk from the vertical (Z-axis).

Trunk Twist sets the angle of rotation of the trunk around the vertical (Z-axis).

Trunk Curving allows you the access to the parameters that set the trunk curving pattern. Trunk Curving button brings up the following dialog box:

Regions along the trunk defines the three distinct curving regions along the trunk. Angles sliders allow you to set the angles which define the extent of curving of each region. Each angle and the region to which it applies are designated by the same color.

Min. segment length sets the longitudinal resolution of the trunk. If you are concerned about the number of polygons, you may set the minimum length of the segment to, for example, 10 cm or more. For the best quality, the minimum segment should be 5 cm or less.

Auto segment length activates or deactivates automatic segmentation. If activated, TREE will vary lengths of the segments depending on the curvature of the trunk in order to give you the best resolution quality for the minimum number of polygons. If automatic segmentation is deactivated, all segments will have the same length set by the Min. segment length.

Trunk Color allows you the access to the parameters of trunk color. Trunk Color button brings up the following dialog box:

ominant color radio buttons allow you to choose red, or green, or blue to be the dominant color for the trunk palette.

PT1 stands for PALETTE 1 which is the trunk palette displayed to the right.

TPC stands for Trunk Primary Color displayed to the left. The primary color can be any color in the palette. You choose the trunk primary color by moving the slider attached to the trunk palette.

The three color fields displayed below the trunk palette are the principal tools for composing the trunk palette. If the dominant color is red, the top color field is designated to the green and the middle one to the blue color component. The bottom color field is always designated to the black color. Each color field enables you to mix chosen amounts of the corresponding color component with the dominant color. The two vertical sliders control the amount of the corresponding color component mixed with the dominant color. The two horizontal sliders define this part of the palette which will be affected by the mixture.

Longitudinal contrast check box activates or deactivates color change along the trunk in longitudinal direction. If active, the trunk color will change from the leftmost color in the palette at the bottom of the trunk to the primary color at the top of the trunk.

Transversal contrast check box activates or deactivates color change along the trunk in transversal direction. If active, the trunk color will change from the leftmost color in the palette to the primary color around its perimeter.

Transversal contrast slider allows you to set the position of the primary color on the perimeter of the trunk.

Texture allows you the access to the parameters of trunk texture. Texture button brings up the following dialog box:

ou can choose three distinct types of trunk texture: smooth - TT1, ringed - TT2, and dry petiole - TT3. Choose the textures by clicking any of the three icons. You can customize ringed texture and dry petiole by clicking the Custom button.

If you select ringed texture - TT2 and click Custom, the following dialog box appears:

ing length sets the length of each ring.

Length change region sets the region of the trunk that will be affected by the ring length change.

Length change sets the extent to which the ring lengths will change across the designated region of the trunk.

Random length sets the variation of the ring length.

Random slope sets the variation of the ring slope.

Width offset sets the positive offset of the ring from the perimeter of the trunk.

Length offset sets the distance between two neighboring rings.

Inverse check box inverses direction of the ring length change.

If you select dry petiole - TT3 and click Custom, the following dialog box appears:

stem width sets the width of dry, pruned stems.

Stem length sets the length of dry, pruned stems.

Length change region sets the region of the trunk that will be affected by the stem length change.

Length change sets the extent to which the lengths of dry stems will change across the designated region of the trunk.

Stem angle sets the angle of dry stems to the trunk.

Stem density sets the density of dry stems across the trunk.

CShaft Height sets the height of the crownshaft. On double click the CShaft Height button, the following dialog box appears:

in. segment length sets the longitudinal resolution of the crownshaft. If you are concerned about the number of polygons, you may set the minimum length of the segment to, for example, 10 cm or more. For the best quality, the minimum segment should be 5 cm or less.

Auto segment length activates or deactivates automatic segmentation. If activated, TREE will vary lengths of the segments depending on the curvature of the crownshaft in order to give you the best resolution quality for the minimum number of polygons. If automatic segmentation is deactivated, all segments will have the same length set by the Min. segment length.

Trans. resolution sets the number of polygons (transversal resolution) for each cylindrical segment of the crownshaft.

Model check box allows you to choose whether to model or not to model the crownshaft.

CShaft Width allows you the access to the parameters that enable you to mold the crownshaft form. CShaft Width button brings up the following dialog box:

Regions along the crownshaft defines the positions of six, characteristic widths along the crownshaft. Width values sliders allow you to set these six, characteristic widths. Each width value and its corresponding position are designated by the same color.

Equalize trunk and crownshaft width check box equalizes the top width of the trunk with the bottom width of the crownshaft.

Min. segment length sets the longitudinal resolution of the crownshaft. If you are concerned about the number of polygons, you may set the minimum length of the segment to, for example, 10 cm or more. For the best quality, the minimum segment should be 5 cm or less.

Auto segment length activates or deactivates automatic segmentation. If activated, TREE will vary lengths of the segments depending on the curvature of the crownshaft in order to give you the best resolution quality for the minimum number of polygons. If automatic segmentation is deactivated, all segments will have the same length set by the Min. segment

length.

CShaft Color allows you the access to the parameters of crownshaft color. CShaft Color button brings up the following dialog box:

T3 stands for PALETTE 3 which is the stem and leaflet palette displayed to the right.

PT2 stands for PALETTE 2 which is the stem and leaflet palette displayed to the right.

PT1 stands for PALETTE 1 which is the trunk palette displayed to the right.

You choose the palette for the crownshaft by clicking PT1, or PT2, or PT3 radio buttons.

CPC stands for Crownshaft Primary Color displayed below. The primary color can be any color in the currently chosen palette. You choose the crownshaft primary color by moving the slider attached to the trunk palette.

Longitudinal contrast check box activates or deactivates color change along the crownshaft in longitudinal direction. If active, the crownshaft color will change from the leftmost color in the palette at the bottom of the crownshaft to the primary color at the top of the crownshaft.

Transversal contrast check box activates or deactivates color change along the crownshaft in transversal direction. If active, the crownshaft color will change from the leftmost color in the palette to the primary color around its perimeter.

Transversal contrast slider allows you to set the position of the primary color on the perimeter of the crownshaft.

Stem Parameters

On double click the Random Seed button, the following dialog box appears:

andom Seed sets the randomization pattern for stem parameters.

Check boxes in the dialog allow you to randomize corresponding stem parameters selectively. For example, if you check the Stem Length check box, each stem on the palm will have slightly different length.

Equalize Random Seeds equalizes the values of random seeds for the trunk, stems, and leaflets. If you want to change random seeds for the trunk, stems, and leaflets selectively, you will leave this check box unchecked.

Stem Length sets the maximum length for stems. On double click the Stem Length button, the following dialog box appears:

egions along the crownshaft defines the positions of three, characteristic stem lengths along the crownshaft. Stem lengths sliders allow you to set these three, characteristic lengths including the maximum stem length. Each

length value and its corresponding position are designated by the same color.

Min. segment length sets the longitudinal resolution of the stem. If you are concerned about the number of polygons, you may set the minimum length of the segment to, for example, 10 cm or more. For the best quality, the minimum segment should be 5 cm or less.

Auto segment length activates or deactivates automatic segmentation. If activated, TREE will vary lengths of the segments depending on the curvature of the stem in order to give you the best resolution quality for the minimum number of polygons. If automatic segmentation is deactivated, all segments will have the same length set by the Min. segment length.

Trans. resolution sets the number of polygons (transversal resolution) for each cylindrical segment of the stem.

Model check box allows you to choose whether to model or not to model the stem.

Stem Width sets the maximum base width for stems. On double click the Stem Width button, the following dialog box appears:

egions along the stem defines the positions of two, characteristic widths along the stem. Stem widths sliders allow you to set these two, characteristic widths. Each width value and its corresponding position are designated by the same color.

Stem Angle sets the maximum stem-to-crownshaft angle for stems. On double click the Stem Angle button, the following dialog box appears:

egions along the crownshaft defines the positions of two, characteristic stem angles along the crownshaft. Angles sliders allow you to set these two, characteristic angles. Each angle value and its corresponding position are designated by the same color.

% of dry leaves sets the percentage of hanging, dry leaves from the bottom of the crownshaft.

Stem Twist sets the angle of rotation of the first stem around the trunk. On double click the Stem Twist button, the following dialog box appears:

Regions along the stem defines the horizontal curving region (twist change) along the stem. Horizontal curving slider allows you to set the angle which defines the extent of horizontal curving of this region. The angle and the region to which it applies are designated by the same color. Stem twist slider allows you to set the angle of rotation of the first stem around the trunk. The twist value and the region to which it applies are designated by the same color.

Stem Curving allows you the access to the parameters that set the stem curving pattern. Stem Curving button brings up the following dialog box:

Regions along the stem defines the three distinct curving regions along the stem. Angles sliders allow you to set the angles which define the extent of curving of each region. Change sliders set the extent and direction of curving change along the crownshaft for each region. Each angle, the corresponding change, and the corresponding region are designated by the same color.

Min. segment length sets the longitudinal resolution of the stem. If you are concerned about the number of polygons, you may set the minimum length of the segment to, for example, 10 cm or more. For the best quality, the minimum segment should be 5 cm or less.

Auto segment length activates or deactivates automatic segmentation. If activated, TREE will vary lengths of the segments depending on the curvature of the stem in order to give you the best resolution quality for the minimum number of polygons. If automatic segmentation is deactivated, all segments will have the same length set by the Min. segment length.

Stem Density sets the density of the stems along the crownshaft. On double click the Stem Density button, the following dialog box appears:

stem density sets the density of the stems along the crownshaft.

Pruning sets the amount of pruned stems from the bottom of the crownshaft.

Random pruning sets the amount of random pruning along the crownshaft.

Pruning length sets the length of pruned stems. Pruning length + check box allows you to specify the length change direction for pruned stems.

First Stem sets the position of the first stem along the crownshaft.

Color allows you the access to the parameters of stem color. Color button brings up the following dialog box:

ominant color radio buttons allow you to choose red, or green, or blue to be the dominant color for the currently active palette.

PT3 stands for PALETTE 3 which is the stem and leaflet palette displayed to the right.

PT2 stands for PALETTE 2 which is the stem and leaflet palette displayed to the right.

You choose to work on PALETTE 2 or PALETTE 3 by clicking PT2 or PT3 radio buttons.

SPC stands for Stem Primary Colors displayed to the left. Each stem palette has its own primary color assigned to it. The primary colors can be any colors in the PALETTE 2 or PALETTE 3. You choose the stem primary color for currently active palette by moving the slider attached to the this palette.

The three color fields displayed below the stem palettes are the principal tools for composing the stem palettes. If the dominant color of the currently active palette is red, the top color field is designated to the green and the middle one to the blue color component. The bottom color field is always designated to the black color.

Each color field enables you to mix chosen amounts of the corresponding color component with the dominant color. The two vertical sliders control the amount of the corresponding color component mixed with the dominant color. The two horizontal sliders define this part of the currently active palette which will be affected by the mixture.

Synch check box synchronizes the value of color spread for leaflets with the

color spread for stems. If active, the value of color spread for the leaflets will be automatically adjusted with the change of color spread for stems and the same groups of stems and leaflets will always share the same palette.

Color spread allows you to assign the two color palettes to different groups of stems in designated proportions.

LC check box stands for Longitudinal Contrast . This check box activates or deactivates color change along the stem in longitudinal direction. If active, the stem color will change from the leftmost color in the corresponding palette at the stem base to the primary color at its top.

LC change stands for Longitudinal Contrast Change. This parameter sets the extent of change in longitudinal contrast among the stems on the palm. The change starts affecting the first stem and reaches maximum on the leaves at the top of the crownshaft.

Leaflet Parameters

Random Seed sets the randomization pattern for leaflet parameters. On double click the Random Seed button, the following dialog box appears:

check boxes in the dialog allow you to randomize corresponding leaflet parameters selectively. For example, if you check the Petiole Length check box, each leaf on the palm will have slightly different petiole length.

Equalize Random Seeds equalizes the values of random seeds for the trunk, stems, and leaflets. If you want to change random seeds for the trunk, stems, and leaflets selectively, you will leave this check box unchecked.

Leaf Type allows you the access to the leaf and leaflet types. Leaf Type button brings up the following dialog box:

you can select two leaf types: palmate and pinnate. Choose the leaf type by clicking any of the two top icons. Select the leaflet type by clicking any of the four bottom icons. D stands for simple, diamond shaped leaflet, and DE for

elliptical diamond shaped leaflet. F stands for simple fan shaped leaflet, and FE for elliptical fan shaped leaflet.

Leaflet width sets the maximum width of the leaflet.

Leaf Length sets the maximum length for leaflets. On double click the Leaf Length button, the following dialog box appears:

Regions along the stem defines the positions of three, characteristic leaflet lengths along the stem. Leaflet lengths sliders allow you to set these three, characteristic lengths. Each length value and its corresponding position are designated by the same color.

Proximal length* sets the position of the maximum width along the leaflet.

*We have borrowed the botanical term to name this parameter. The above definition does not adhere strictly to the botanical definition of the term

which refers to unsegmented portion of the palm leaf.

Random offset sets the extent of variation in the lengths of leaflets.

Leaflet Angle sets the maximum leaflet-to-parent stem angle for leaflets. On double click the Leaflet Angle button, the following dialog box appears:

Regions along the stem defines the positions of two, characteristic leaflet angles along the stem. Change and First leaflet angle sliders allow you to set these two, characteristic angles. Each angle value and its corresponding position are designated by the same color.

Random offset sets the extent of variation in the angles of leaflets.

Leaflet Twist sets the angle of rotation of the first leaflet around the parent

stem. On double click the Leaf Twist button, the following dialog box appears:

first leaflet twist sets the angle of rotation of the first leaflet around the parent stem.

Random offset sets the extent of variation in the twists of leaflets.

TC - mirrored stands for the mirrored twist change. This parameter sets the amount of the mirrored twist change where each subsequent leaflet is rotated around its parent stem so that it mirrors the previous leaflet. Many palms exhibit this characteristic, and the variations of popularly named "Bottle Palm" are among the ones where this type of twist change is the most apparent (see "Bottle Palm" from TREE Palm Library).

Regions along the stem defines the leaflet rolling region along the stem.

% of rolled leaves sets the amount of rolled leaves on the palm.

Max. leaf roll sets the maximum rolling angle for the leaves.

Random leaf roll sets the extent of variation in the amount of rolling.

Leaflet Curving allows you the access to the parameters that set the leaflet curving pattern. Leaflet Curving button brings up the following dialog box:

Regions along the leaflet defines the three distinct curving regions along the leaflet. Angles sliders allow you to set the angles which define the extent of curving of each region. Change sliders set the extent and direction of curving change along the crownshaft for each region. Each angle, the corresponding change, and the corresponding region are designated by the same color.

Random regions sets the extent of variation for the curving regions.

Random angles sets the extent of variation for the curving angles.

ExtReg1 stands for Extend Region 1. This parameter sets the amount of leaflets whose current setting for the regions will be overridden by extending the first region across the length of the leaflet.

Min. segment length sets the longitudinal resolution of the leaflet. If you are concerned about the number of polygons, you may set the minimum length

of the segment to, for example, 10 cm or more. For the best quality, the minimum segment should be 5 cm or less.

Leaf Density sets the density of the leaflets along the stem. On double click the Leaf Density button, the following dialog box appears:

Pruning factor sets the amount of leaflets to be pruned.

Petiole Length sets the position of the first leaflet along the stem.

Color allows you the access to the parameters of stem color. Color button brings up the following dialog box:

ominant color radio buttons allow you to choose red, or green, or blue to be the dominant color for the currently active palette.

PT3 stands for PALETTE 3 which is the stem and leaflet palette displayed to the right.

PT2 stands for PALETTE 2 which is the stem and leaflet palette displayed to the right.

You choose to work on PALETTE 2 or PALETTE 3 by clicking PT2 or PT3 radio buttons.

LPC stands for Leaflet Primary Colors displayed to the left. Each leaflet palette has its own primary color assigned to it. The primary colors can be any colors in the PALETTE 2 or PALETTE 3. You choose the leaflet primary color for currently active palette by moving the slider attached to the this palette.

The three color fields displayed below the leaflet palettes are the principal tools for composing the leaflet palettes. If the dominant color of the currently active palette is red, the top color field is designated to the green and the middle one to the blue color component. The bottom color field is always designated to the black color.

Each color field enables you to mix chosen amounts of the corresponding color component with the dominant color. The two vertical sliders control the amount of the corresponding color component mixed with the dominant color. The two horizontal sliders define this part of the currently active palette which will be affected by the mixture.

Synch check box synchronizes the value of color spread for stems with the color spread for leaflets. If active, the value of color spread for the stems will be automatically adjusted with the change of color spread for leaflets and the same groups of stems and leaflets will always share the same palette.

Color spread allows you to assign the two color palettes to different groups of

leaflets in designated proportions.

LC check box stands for Longitudinal Contrast . This check box activates or deactivates color change along the leaflet in longitudinal direction. If active, the leaflet color will change from the leftmost color in the corresponding palette at the leaflet base to the primary color at its top.

LC change stands for Longitudinal Contrast Change. This parameter sets the extent of change in longitudinal contrast among the leaflets on the palm. The change starts affecting the leaflets of the first stem and reaches maximum on the leaves at the top of the crownshaft.