Landscape Block Circle Algorithm :Equations 5 to 11 building rings out

The red dashed lines in figures 2 to 5 and 7 indicate the lip on a block's underside that enages the faces of the blocks in the next ring out.

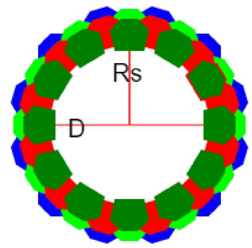

Figure 1

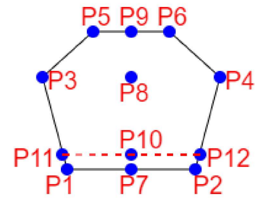

Figure 2 & 7

As stated in the overview R_s is the initial starting value.

Equations 5 to 11 are repeated N_rs is substituted in for R_1 for the innermost ring in equation 1 below and then for the remaining rings . Equations 5 to 11 are done and then R_5 is substituted in for R_1 of the next ring for all successive outer rings.

All of the Radii (R_x) have one end at the center of the circle. The other endpoints are: R_1 (P_7),R_3 (P_{10}),R_4 (P_{11} or P_{12}), and R_5 (P_7 of the next ring out)

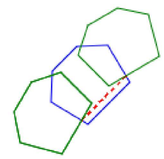
Figure 3

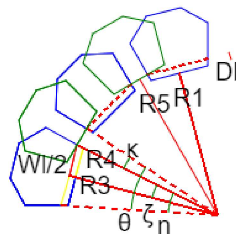

Figure 4

Notes:

1. **G** must be less than $\mathbf{W_l}$ or the lip of the block won't engage on the face
2. **G** increases as the rings progress outward
3. $\mathbf{B_r}$ (blocks in a ring) can be less than the calcuated number also long as **G** of the outer ring is less than $\mathbf{W_f}$

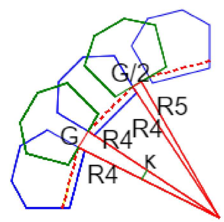

Figure 5

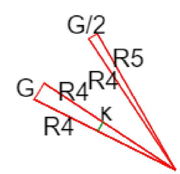

Figure 6

EQN 5: $R_3 = R_1 + D_1$

EQN 6: $R_4 = \sqrt{(R_3^2+(W_1/2)^2)}$

R_4 is the hypotenuse (side c) of a right triangle so subbing R_3 for a and $W_1/2$ for b

into $c^2 = a^2 + b^2$ gives

$R_4^2 = R_3^2+(W_1/2)^2$

taking the square root of both sides gives $R_4 = \sqrt{(R_3^2+(W_1/2)^2)}$

EQN 7: $\eta = \text{arccosine}(1-W_1^2/(2\bullet(R_4^2))$

law of cosines: $c^2 = a^2 + b^2 - 2ab\text{cosine}(\gamma)$

if $a = b$ then $c^2 = 2a^2 - 2a^2\text{cosine}(\gamma)$

and then $c^2 = 2a^2(1\text{-cosine}(\gamma))$

$c^2/2a^2 = 1\text{-cosine}(\gamma)$

$\text{cosine}(\gamma) = 1- c^2/2a^2$

$\gamma = \text{arccosine}(1- c^2/2a^2)$

substituting η for γ ; W_1 for c; and R_4 for a gives

$\eta = \text{arccosine}(1-W_1^2/(2\bullet(R_4^2))$

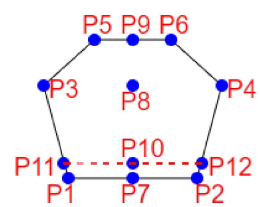

Figure 7 & 2

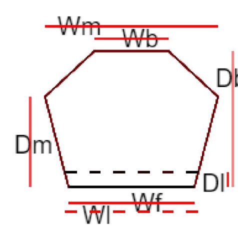

Figure 8

EQN 8: $\theta = 360 / B_r$ 360 degrees by blocks in a circle ring

EQN 9: $\kappa = \theta - \eta$

EQN 10: $G = \sqrt{(2\bullet R_4^2(1\text{-cosine}(\kappa)))}$

law of cosines: $c^2 = a^2 + b^2 - 2ab\text{cosine}(\gamma)$

if $a = b$ then $c^2 = 2a^2 - 2a^2\text{cosine}(\gamma)$

and then $c^2 = 2a^2(1\text{-cosine}(\gamma))$

taking the square root of both sides gives $c = \sqrt{(2a^2(1\text{-cosine}(\gamma)))}$

substituting κ for γ; R_4 for a; and G for c gives

$G = \sqrt{(2\bullet R_4^2(1\text{-cosine}(\kappa)))}$

EQN :11 $R_5 = \sqrt{(R_4^2-(G/2)^2)}$

R_5 and G/2 are perpendicular sides of a right triangle with R_4 being the hypotenuse

so $c^2 = a^2 + b^2$ describes the triangle

rearranging gives $a^2 = c^2 - b^2$ taking the square root gives $a = \sqrt{(c^2 - b^2)}$

substituting R_5 for a; R_4 for c; and G/2 for b gives

$R_5 = \sqrt{(R_4^2-(G/2)^2)}$