Examination of Envelope Detector Algorithm
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First, examine situation in base-10 number system....

$ii := 0 .. 999$

$P_{ii} := \frac{ii + 1}{1000}$ Power Input

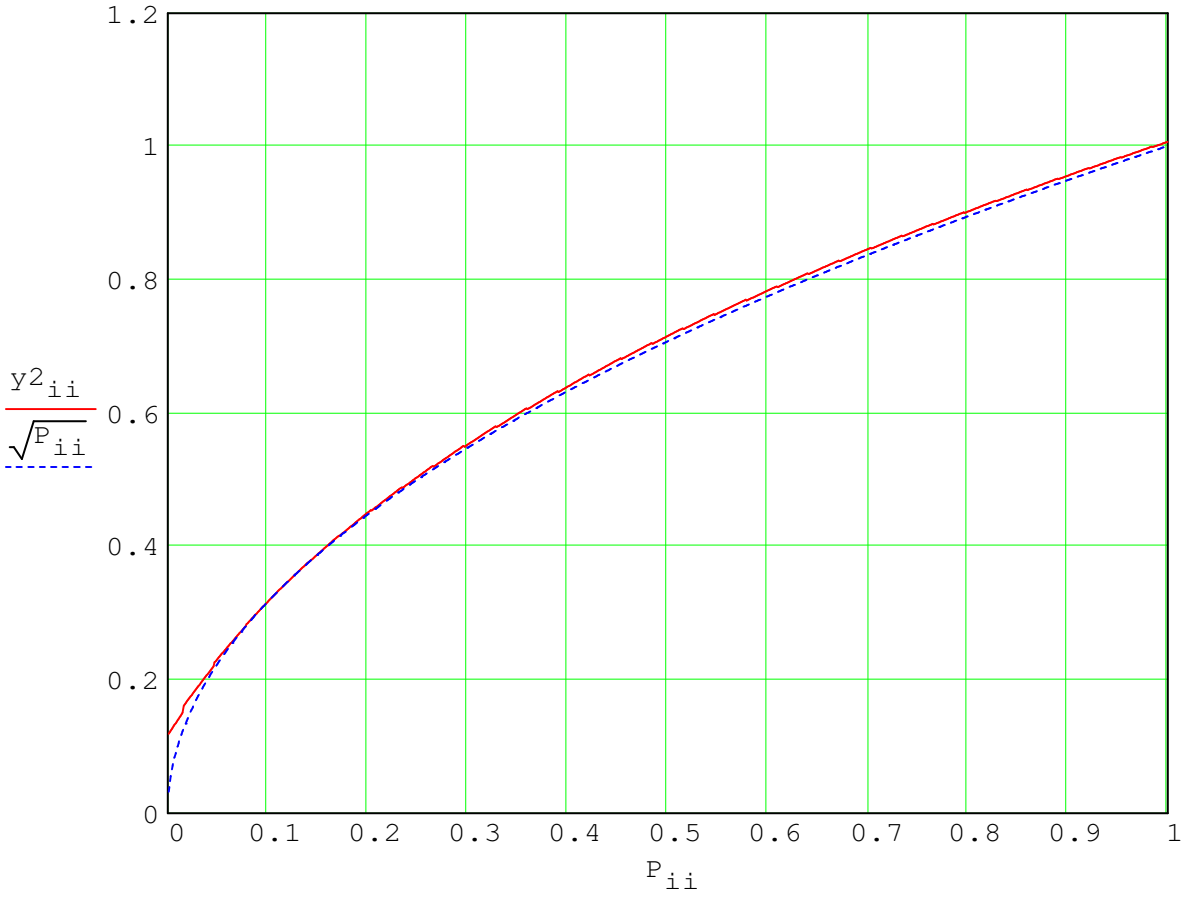
Use table look up to assist in initial estimate for sqrt.

$y0_{ii} := \sqrt{floor\left(\frac{P_{ii}}{0.03125} + 0.5\right) \cdot 0.03125 + 0.15} \cdot 1.2$

$y1_{ii} := 0.5 \cdot \left(y0_{ii} + \frac{P_{ii}}{2}\right)$ First Iteration

$y2_{ii} := 0.5 \cdot \left(y1_{ii} + \frac{P_{ii}}{y1_{ii}}\right)$ Second Interation

$y3_{ii} := 0.5 \cdot \left(y2_{ii} + \frac{P_{ii}}{y2_{ii}}\right)$ Third Iteration


1.2
1
0.8
0.6
0.4
0.2
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
P_{ii}
$\frac{y2_{ii}}{\sqrt{P_{ii}}}$

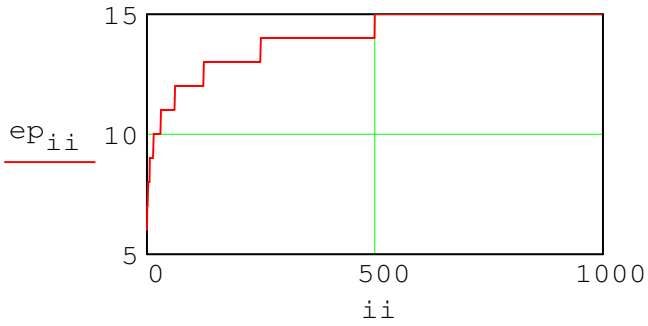
Turns out that in binary representation, do not need to go to a lookup table as badly. (Decimal form without lookup table was extremely poor.)

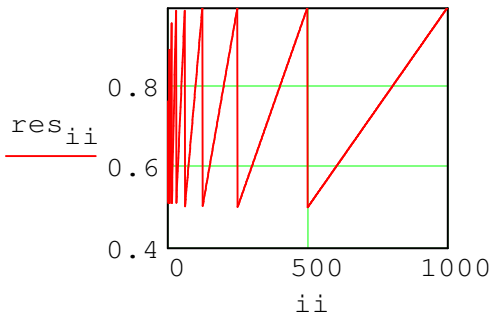
Don't want to add another iteration since each one requires a division operation, so a table lookup is better choice.

$bn_{ii} := \text{floor}\left(P_{ii} \cdot 2^{15} + 0.5\right)$ Convert to binary form

$ep_{ii} := \text{ceil}\left(\frac{\log(bn_{ii})}{\log(2)}\right)$ Derive binary exponent

$res_{ii} := \frac{bn_{ii}}{2^{ep_{ii}}}$ Extract residue





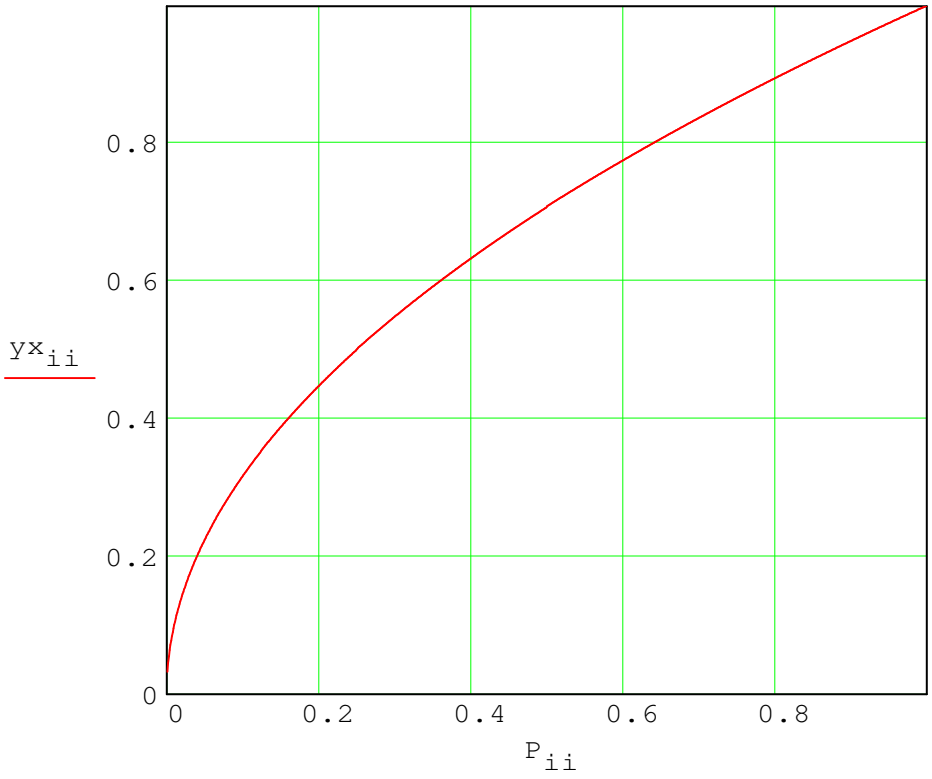
Implement 2-step algorithm on residue portion only.

$y1_{ii} := 0.5 \cdot (1 + res_{ii})$

$y2_{ii} := 0.5 \cdot \left(y1_{ii} + \frac{res_{ii}}{y1_{ii}}\right)$

$yx_{ii} := \frac{y2_{ii} \cdot 2^{0.5 \cdot ep_{ii}}}{256} \cdot \sqrt{2}$

Square Root Algorithm Performance With 2-Step Formula + Binary Representation



Percentage Error

$$\frac{\sqrt{P_{ii}} - yx_{ii}}{yx_{ii}} \cdot 100$$