Root Squaring for Root Finding

ABSTRACT

We use root squaring to aproximate the root radius of polynomials.

CCS CONCEPTS

• **Computing methodologies → Hybrid symbolic-numeric methods**.

KEYWORDS

symbolic-numeric computing, root finding, polynomial algorithms, computer algebra

ACM Reference Format:
. 2018. Root Squaring for Root Finding. In *Proceedings of Make sure to enter the correct conference title from your rights confirmation emai (Conference acronym 'XX).* ACM, New York, NY, USA, 2 pages. https://doi.org/XXXXXXX.XXXXXXX

1 INTRODUCTION

2 RELATED WORKS

3 BACKGROUND

4 MOTIVATING EXAMPLE

5 ALGORITHM DESIGN

Algorithm 1 circ_roots_rational_form(p, q, l)

r, s := angle_sq_root(p, q)
t, u := angle_neg(r, s)
if l == 1 **then**
  return [(r, s),(t, u)]
else if l != 0 **then**
  left := circ_roots_rational_form($r, s, l - 1$)
  right := circ_roots_rational_form($t, u, l - 1$)
  return left ∪ right
else
  return [(p, q)]
end if

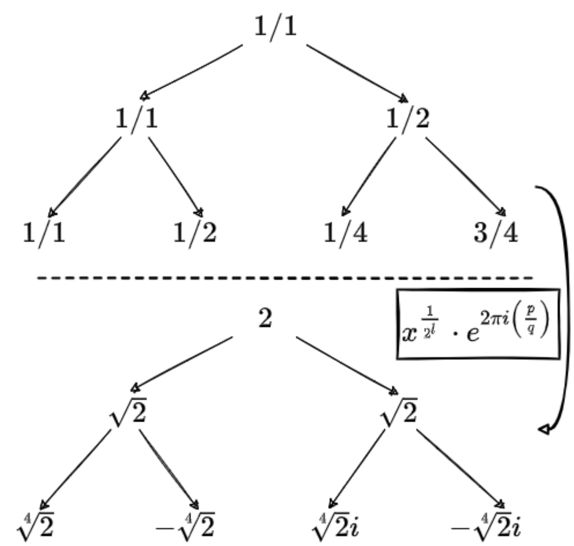

Figure 1: The steps of circ_roots_rational_form(p,q,l) in Alg.1.

Algorithm 2 angle_sq_root(p,q)

if $p\%q$ == 0 **then**
  return (1,1)
else
  return (p,2q)
end if

Algorithm 3 angle_neg(p,q)

if p%q == 0 **then**
  return (1,2)
else
  return ($2p + q, 2q$)
end if

Conference acronym 'XX, June 03–05, 2018, Woodstock, NY

ACM ISBN 978-1-4503-XXXX-X/18/06…$15.00
https://doi.org/XXXXXXX.XXXXXXX

Algorithm 4 DLG_rational_form(p, p', r, t, u, l)

root := roots(r, t, u, l)
for $r_i \in$ root **do**
  base_step[i] := $\frac{p'(r_i)}{p(r_i)}$
end for
diff[0] := base_step
for $i \leq l$ **do**
  for $j \leq 2^{l-i-1}$ **do**
    diff[$i+1$][j]:=$\frac{1}{2}\frac{\text{diff}[i][2j]-\text{diff}[i][2j+1]}{\text{root}[2j]}$
    root = roots($r, t, u, l-1-i$)
  end for
end for
return derivs[l][0]

6 THEORETICAL ANALYSIS

7 EXPERIMENTAL RESULTS

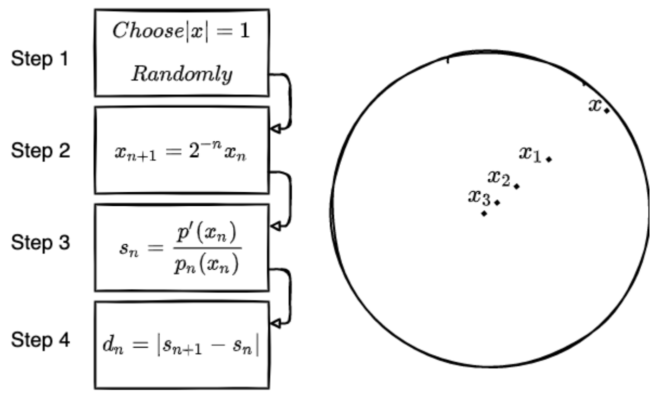

Figure 2: Limit test.

8 CONCLUSION

REFERENCES