# Report of PI

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1. Problem

Calculate the first n digits of pi

1. Method

1. **J.Marchin** method for computing

= (0)

for arctan(x) use the **Taylor series formula** to calculate better

arctan(x) = x - (x^3)/3 + (x^5)/5 - (x^7)/7 +.... (1)

and make X = x\*x, the formula can be

arctan(x) = x(1 + X(1/3 – X(1/5 – X(…))) (2)

Thus all we need to calculate (2) for 16\*arctan(1/5) and 4\*arctan(1/239)

And minus them to get the result

2.**high precision calculation:** addition, minus, multiply and division

to overcome the overflow problem when n (number to calculate) gets

really big save time for high precision calculation, all the number use the

array of int, however, when dealing with the division, there might be

multiplication overflow problem, thus use the long long temporary

variable to store them, to make the calculation a little bit fast

1. The **time complexity**, the Taylor series need to calculate the number

of iteration time when convergence, so use the formula

Maximum iteration time(MT) = N \* log(BASE) / 2 / log(x) (3)

And them for each high precision calculation, need the

BT = N/(compression bit)

So the total time complexity therefore is O(MT\*BT), it is **rather slow** when the number gets **bigger**.

1. Unit test

1.Baseline is the first 100000 digits of

2.Device:



3. test result

|  |  |
| --- | --- |
| Number of digits | Time (second) |
| 10000 | 3.64168 |
| 40000 | 58.0828 |
| 100000 | 369.102 |