# ESc 101: Fundamentals of Computing

Lecture 7

Jan 14, 2010

# CALCULATING VALUE OF $\pi$

- We use the series

$$\frac{\pi}{4} = \sum_{k=0}^{\infty} \frac{(-1)^k}{2k+1}.$$

- Since $\pi$ is irrational, it can never be calculated exactly.
- Take as input the truncation point, i.e., value of $K$ such that $\pi$ is approximated as

$$\sum_{k=0}^{K} (-1)^k \frac{4}{2k+1}.$$

# CALCULATING $\pi$

```c
main()
{
   float pi;
   int K;
   int k;

   printf("Enter the degree of approximation: ");
   scanf("%d", &K);
   for (k = 0, pi = 0.0; k <= K; k++) {
      if (k % 2 == 0) /* k is even */
         pi = pi + 4.0 / (2 * k + 1);
      else /* k is odd */
         pi = pi - 4.0 / (2 * k + 1);
   }
   printf("The value of pi is: %f\n", pi);
}
```

# COMMENTS

- Comments in C are enclosed between /* and */.
- The compiler ignores all comments.
- Comments are very useful in annotating problems making them more understandable.
- One should comment all non-obvious parts of a program explaining its function.

# LOSS OF PRECISION

- When using `float` type for storing the value of $\pi$, the precision is good only for five digits after the decimal point.
- Using `double` gives much better precision.

# DIVISION OPERATOR

- / represents the division operation in C.
- This operator tries to be "smart":
  - ▸ If both operands are integer, it results only the quotient ignoring the remainder.
  - ▸ For example, 2 is the result of 12/5.
- So, if we replace 4.0 in the above program with 4, the program does not calculate the value of $\pi$ properly!