Variables

Last updated 6/15/23

These slides introduce variables in C

Variables

- Variable
  - Symbolic representation for a value - name
  - Stored in memory (data)
  - Can be modified during execution
  - Since it requires space in memory it must have a type to tell the compiler how much space to reserve
  - Naming
    - Allowed characters: letters, numbers, _
    - Cannot begin with a number
    - Cannot be the same as a function name

Variables

- Variable Declaration

  - Specify the type and name for a variable
  - Must be declared before it can be used

```
int foo;
float rate;
char initial1;

int var1, this, is, not, a, good, practice;          // create 7 variables

int AccountBalance;
int annual_interest_rate;
```

** Note: name length has no impact on compiled program size
- focus on readable code

Variables

- Variable Initialization
  - Variables are not initialized just by declaring them
    - They do not automatically have a value of 0
    - They may well have garbage values
  - You must provide an initial value if desired (initialization)

```
int foo = 23;
```

Our prescribed method

```
int count;
count = 0;
```

```
char fx = ‘A’;
```

```
int foo, boo = 23;
```

```
int foo = 23, boo = 23;
```

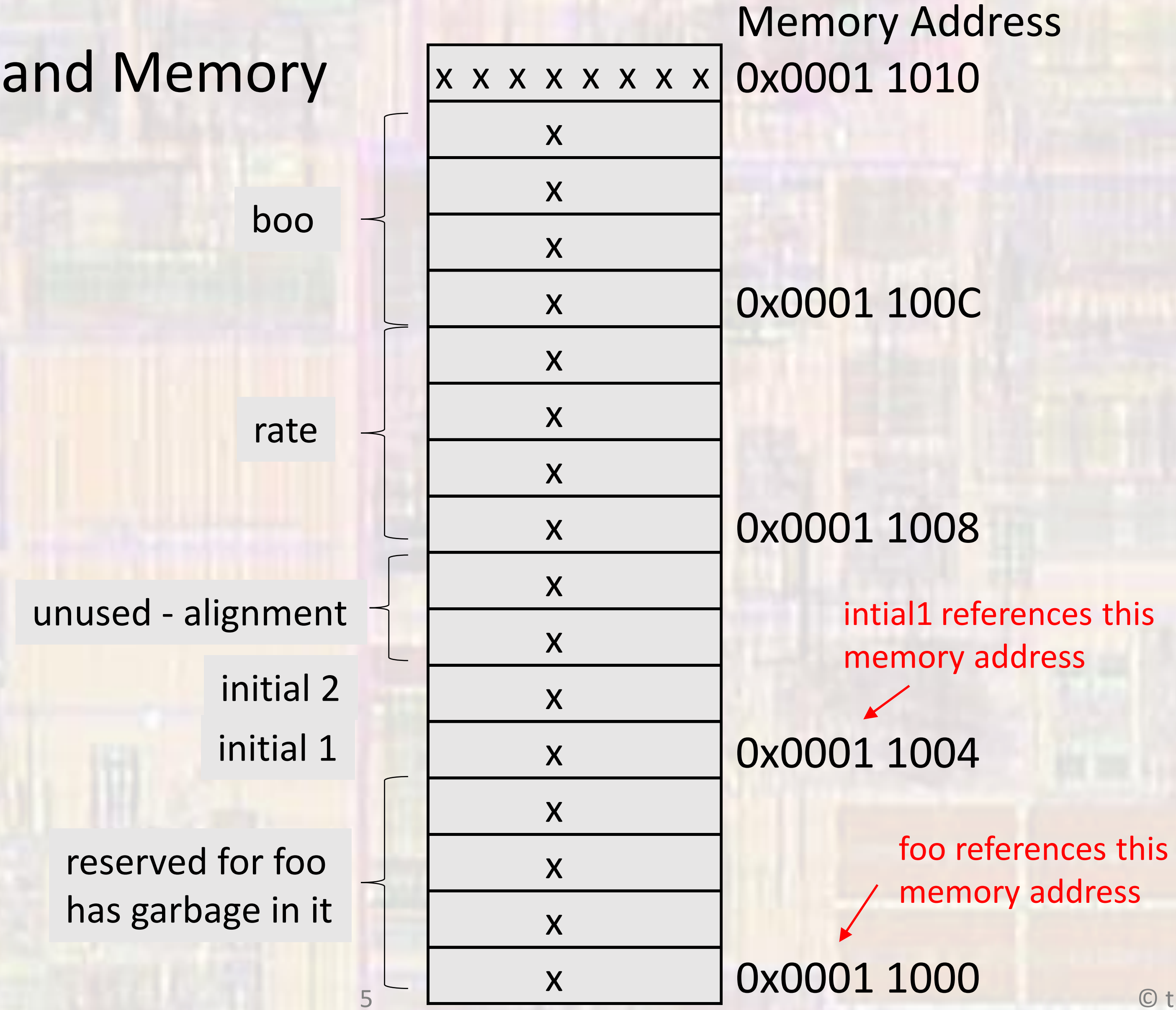
```
float pie = 3.14159;
```

Nothing stops you from using an un-initialized variable → garbage

Variables

- Variables and Memory

```
int foo;
char initial1;
float rate;
char initial 2;
int boo;
```



Memory Address

x x x x x x x x 0x0001 1010

boo

0x0001 100C

rate

0x0001 1008

unused - alignment

initial 2

initial 1

0x0001 1004

reserved for foo
has garbage in it

0x0001 1000

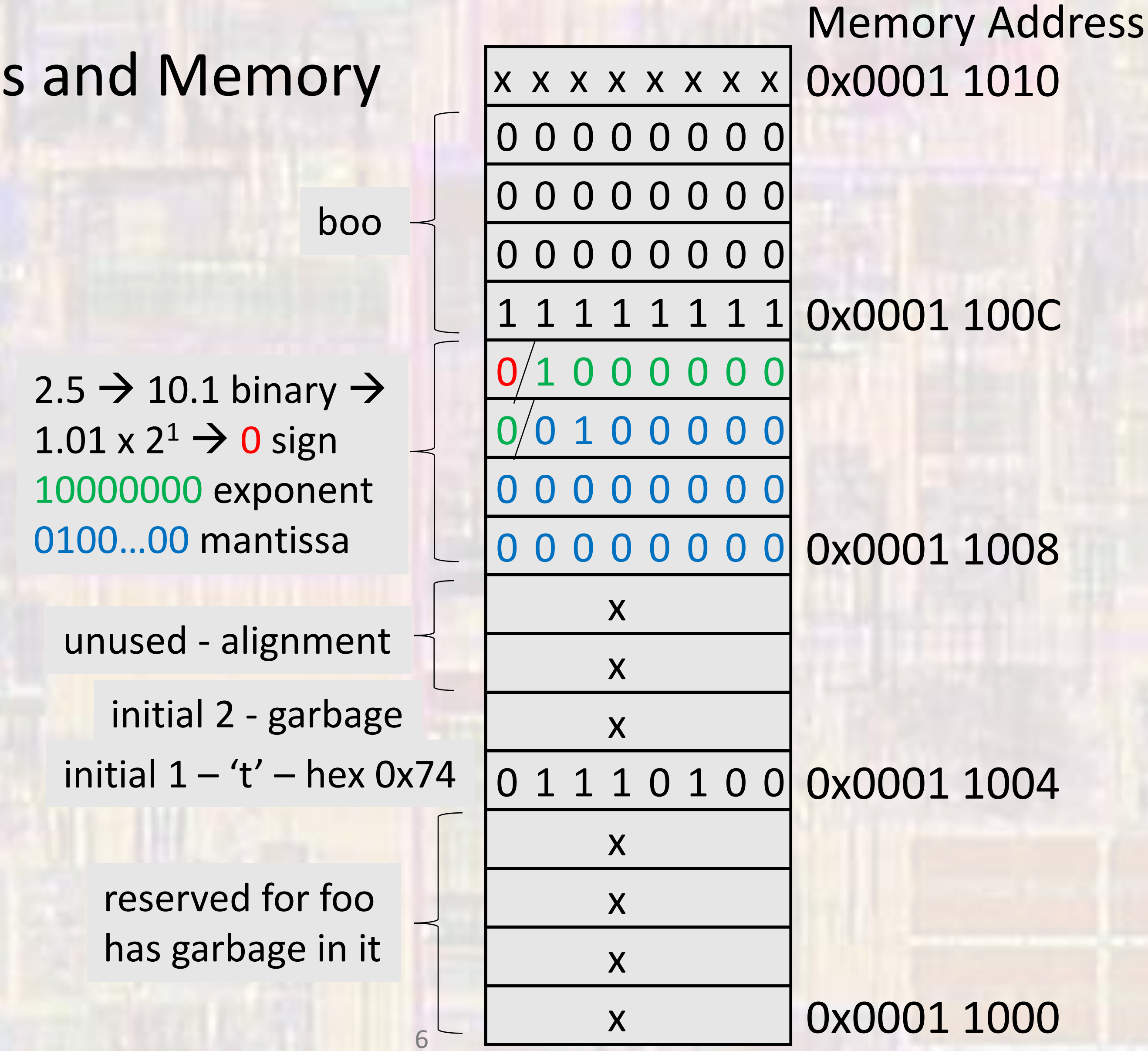
intial1 references this memory address

foo references this memory address

Variables

- Variables and Memory

```
int foo;
char initial1;
float rate;
char initial 2;
int boo;
initial1 = ‘t’;
rate = 2.5;
boo = 255;
```



	Contents	Memory Address
	x x x x x x x x	0x0001 1010
boo	0 0 0 0 0 0 0 0	
	0 0 0 0 0 0 0 0	
	0 0 0 0 0 0 0 0	
	1 1 1 1 1 1 1 1	0x0001 100C
2.5 → 10.1 binary → 1.01 x 2^1 → 0 sign 10000000 exponent 0100…00 mantissa	0/1 0 0 0 0 0 0 0	
	0/0 1 0 0 0 0 0 0	
	0 0 0 0 0 0 0 0	
	0 0 0 0 0 0 0 0	0x0001 1008
unused - alignment	x	
	x	
initial 2 - garbage	x	
initial 1 – ‘t’ – hex 0x74	0 1 1 1 0 1 0 0	0x0001 1004
reserved for foo has garbage in it	x	
	x	
	x	
	x	0x0001 1000