

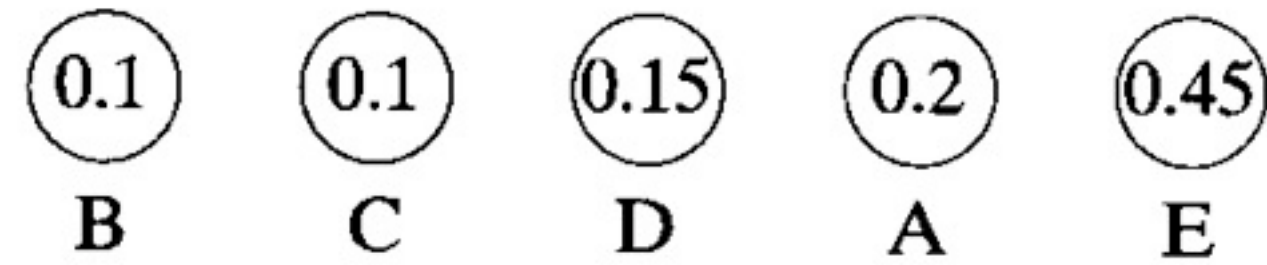
This is CS50.

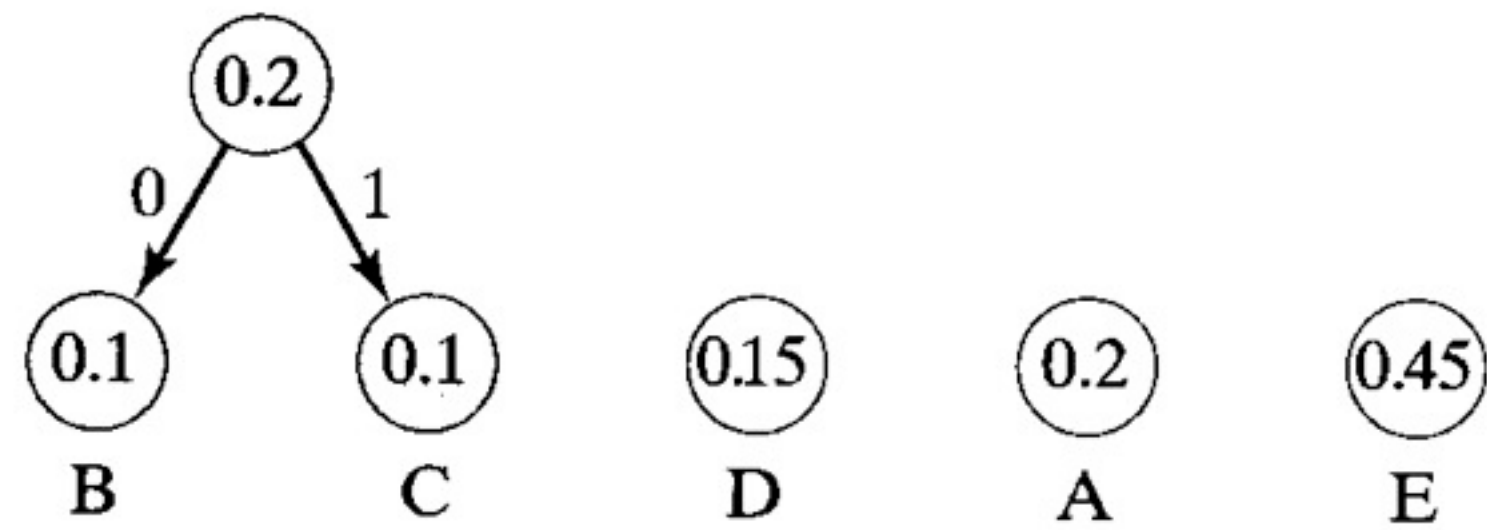
morse code

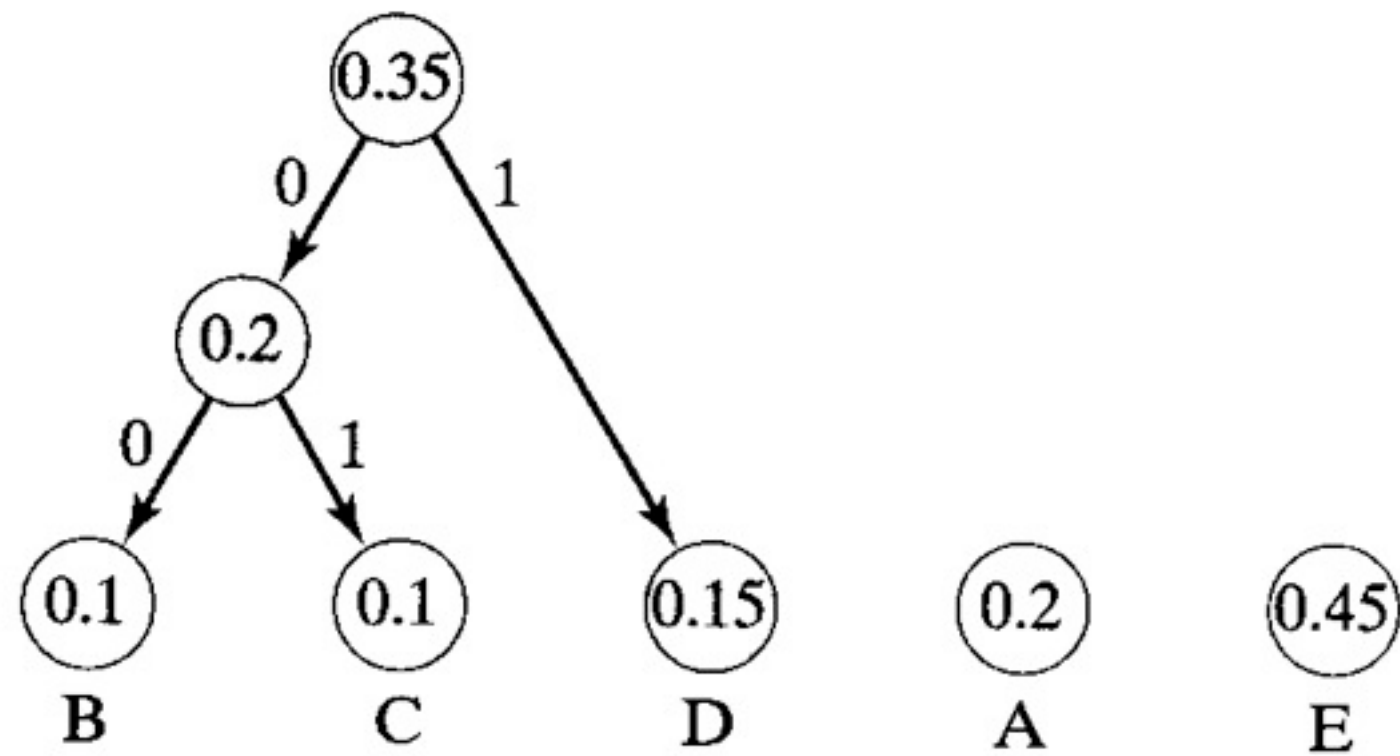
A	• —	U	• • —
B	— • • •	V	• • • —
C	— • — •	W	• — —
D	— • •	X	— • • —
E	•	Y	— • — —
F	• • — •	Z	— — • •
G	— — •		
H	• • • •		
I	• •		
J	• — — —		
K	— • —	1	• — — — —
L	• — • •	2	• • — — —
M	— —	3	• • • — —
N	— •	4	• • • • —
O	— — —	5	• • • • •
P	• — — •	6	— • • • •
Q	— — • —	7	— — • • •
R	• — •	8	— — — • •
S	• • •	9	— — — — •
T	—	0	— — — — —

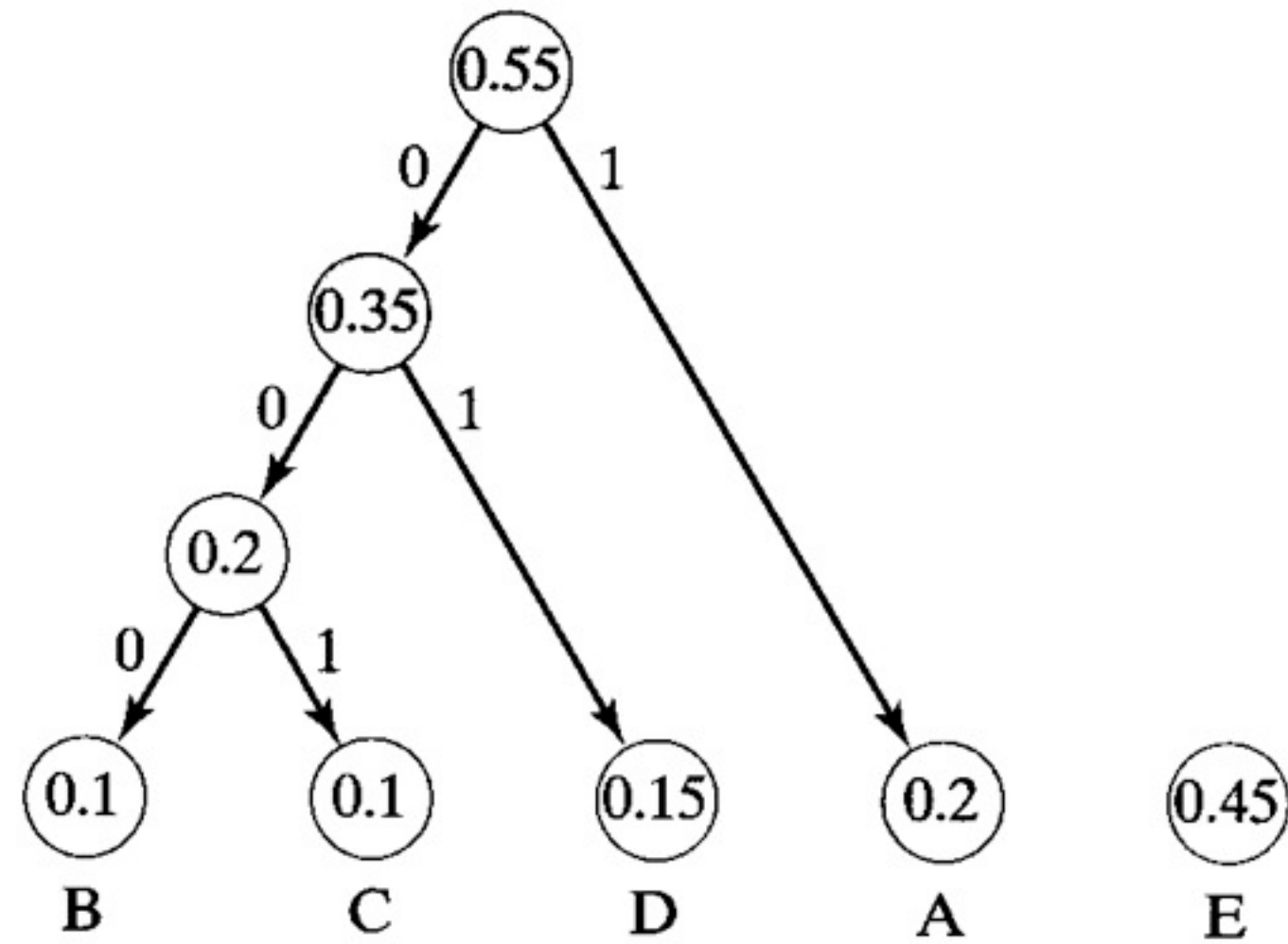
“ECEABEADCAEDEEEEECEADEEEEEEDBAAEABDBBAAEAAAC
DDCCEABEEDCBEEDEAEFEFEFEAEEDBCEBEEADEAEEDAEBBC
DEDEAEEDCEEAEFEF”

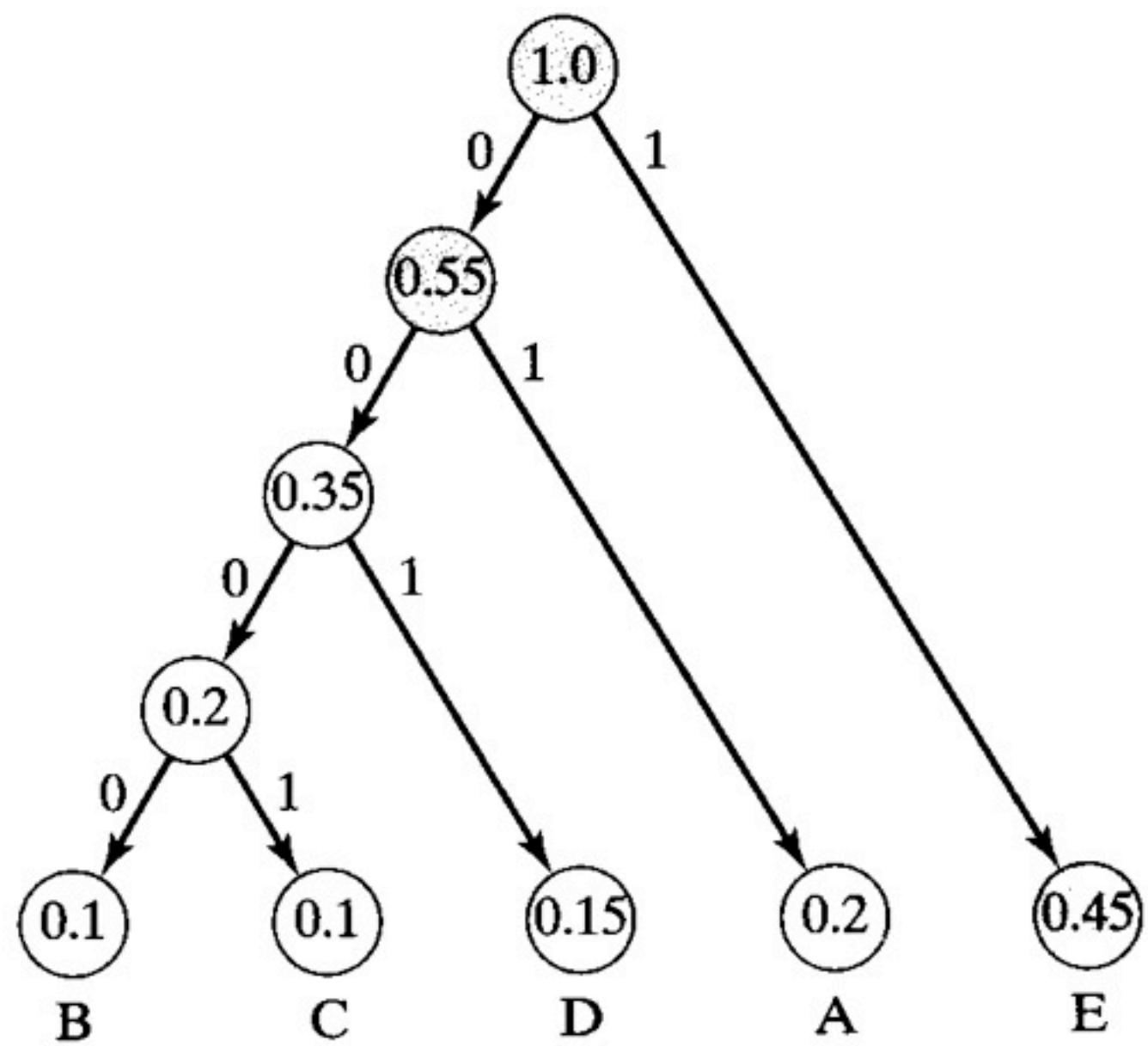
character	A	B	C	D	E
frequency	0.2	0.1	0.1	0.15	0.45












```
typedef struct node
{
    char symbol;
    float frequency;
    struct node* left;
    struct node* right;
}
node;
```

bitwise operators

A 01000001

a 01100001

A	01000001
	00100000
a	01100001

a 01100001

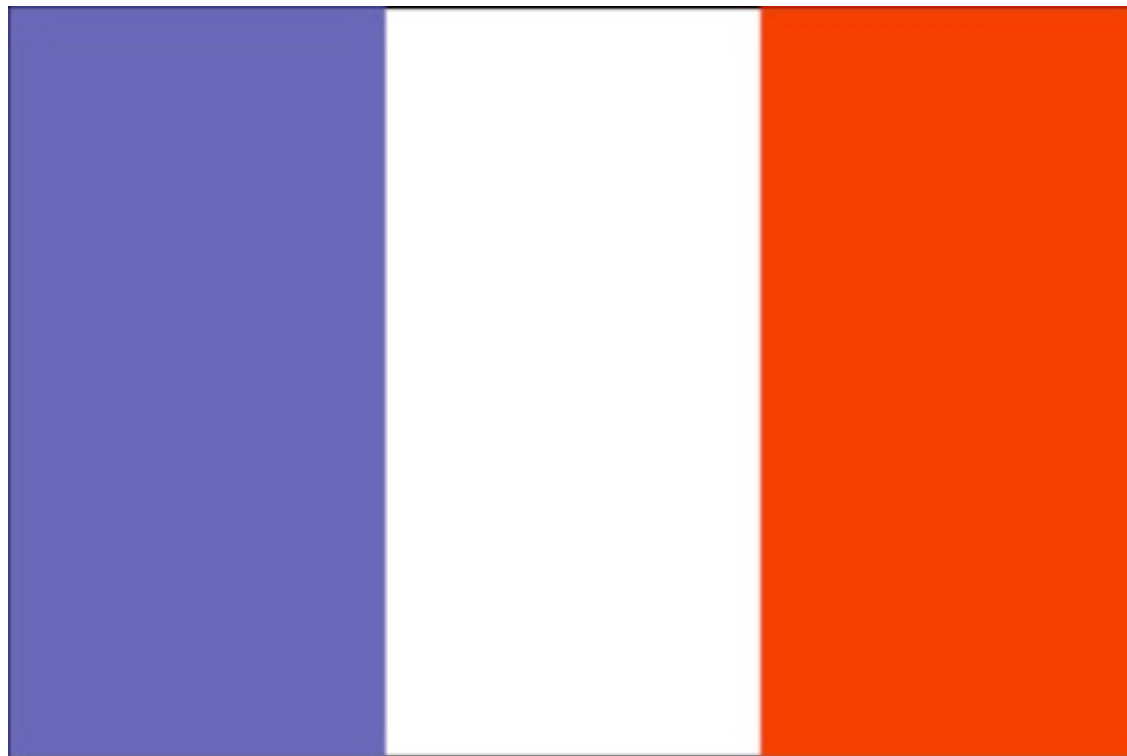
A 01000001

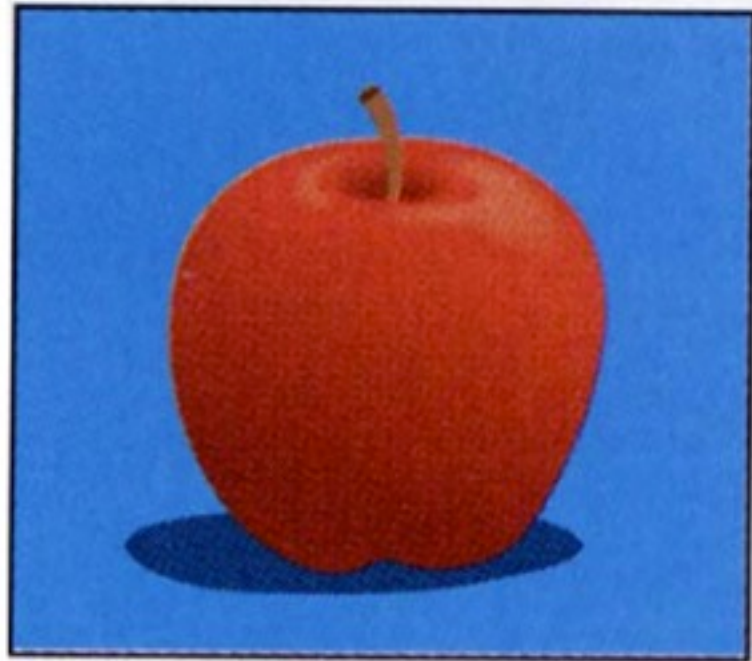
a 01100001

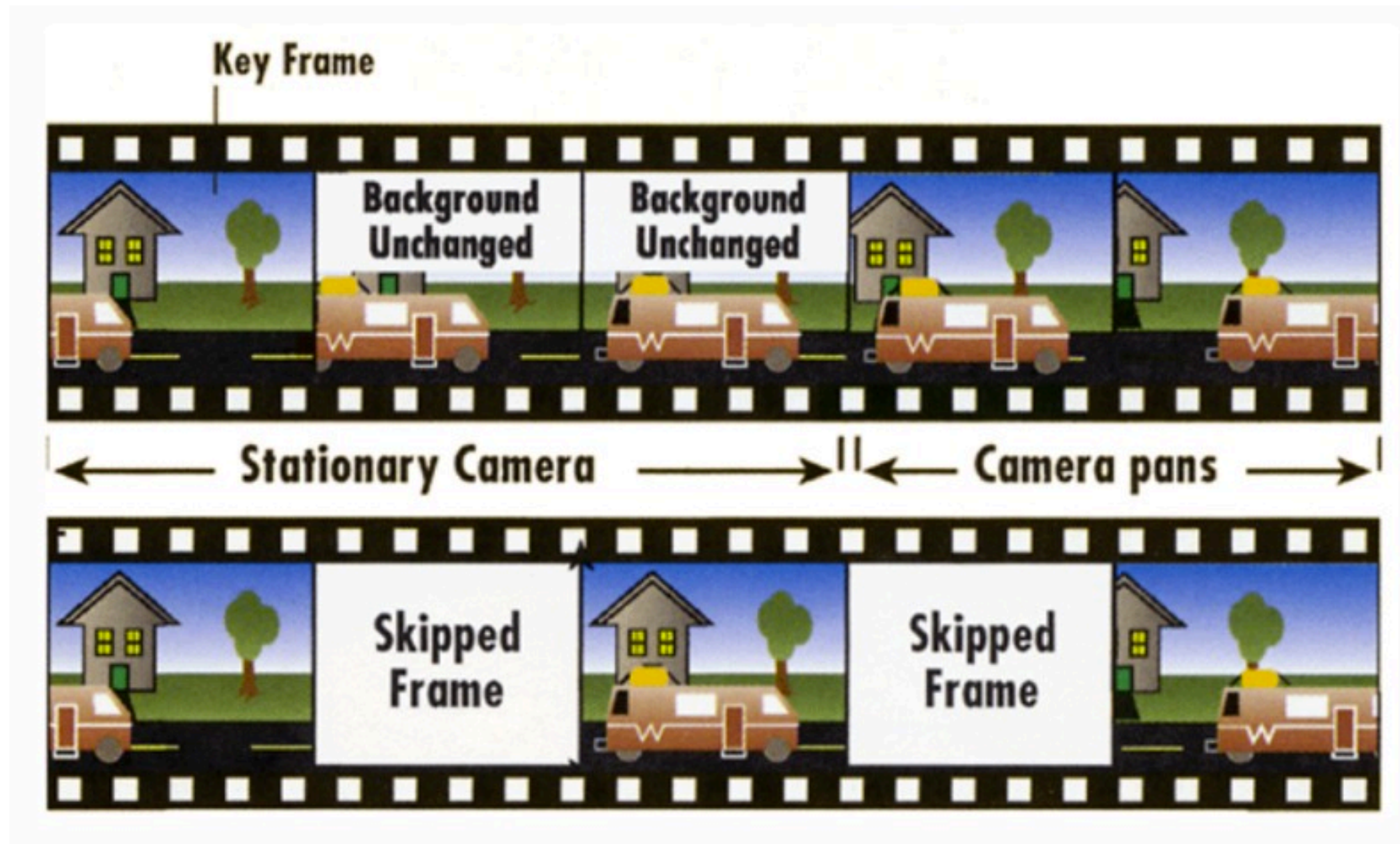
& 11011111

A 01000001



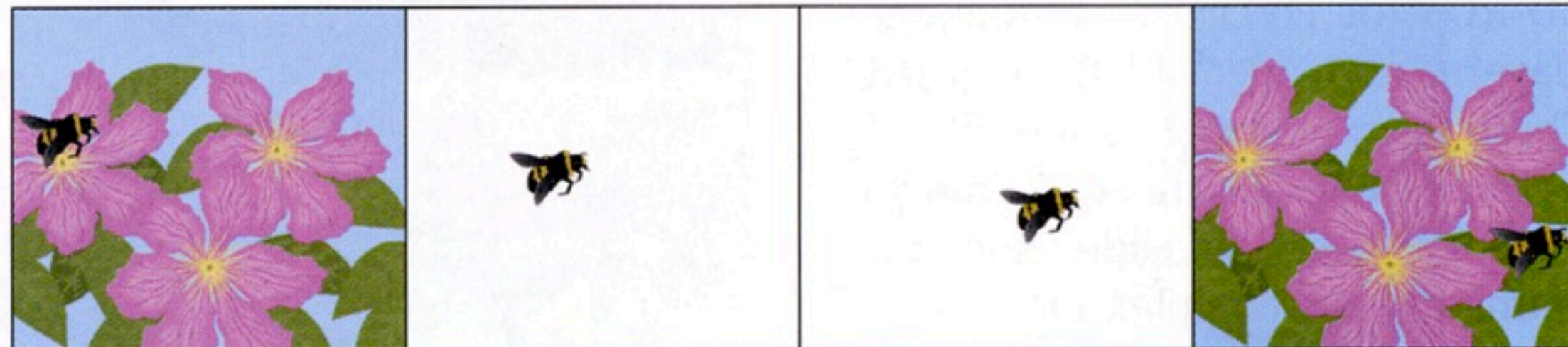








Uncompressed video



Compressed video

pre-processing

compiling

assembling

linking

```
#include <stdio.h>
```

```
int main(void)
```

```
{
```

```
    printf("hello, world!");
```

```
    return 0;
```

```
}
```

```

        .file      "hello1.c"
        .text
        .globl    main
        .align    16, 0x90
        .type     main,@function
main:                                     # @main
# BB#0:
        pushl     %ebp
        movl %esp, %ebp
        subl $24, %esp
        leal .L.str, %eax
        movl $0, -4(%ebp)
        movl %eax, (%esp)
        calll    printf
        movl $0, %ecx
        movl %eax, -8(%ebp)             # 4-byte Spill
        movl %ecx, %eax
        addl $24, %esp
        popl %ebp
        ret
.Ltmp0:
        .size     main, .Ltmp0-main

        .type     .L.str,@object        # @.str
        .section  .rodata.str1.1,"aMS",@progbits,1
.L.str:
        .asciz    "hello, world!\n"
        .size     .L.str, 15

        .section  ".note.GNU-stack","",@progbits

```

10000011	00000001	00010001	00000000	00111101	11111100	01110100	00111101
00000000	01000000	00000000	00000000	00000000	00000000	00000000	00000000
10010000	00000000	00000000	00000000	01010000	00000000	00000111	00110000
00001011	00000001	00001011	00000011	00001010	00000000	00000000	00000000
00000000	00100000	00000000	00000000	00000000	00000000	00000000	00000000
00000000	00100000	00000000	00000000	00000000	00000000	00000000	00000000
00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
01110000	00010000	00000000	00100000	00000001	00000000	00000000	00000000
00000000	00000000	00000000	00100000	00000001	00000000	00000000	00000000
00000000	00000000	00000000	01000000	00000001	00000000	00000000	00000000
00000000	00100000	00000000	01000000	00000001	00000000	00000000	00000000
11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
10010000	10000000	00000000	01000000	00000001	00000000	00000000	00000000
00101110	01100100	01111001	01101110	01100001	01101101	01101001	01100011
10110000	00000100	00000000	00100000	00000001	00000000	00000000	00000000
10110000	00000100	00000000	00100000	00000001	00000000	00000000	00000000
10100000	00000001	00000000	00000000	00000000	00000000	00000000	00000000
10110000	00000100	00000000	00000000	00000000	00000000	00000000	00000000
00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
00000000	00000000	00000000	00000000	00000000	00100000	00000000	00000000

. . .

hello.c
[uses printf]



compile

assembly code
for hello.c



assemble

```
01101001 01001010 10000010 11011001  
00101011 01100000 10001011 10111010
```


hello.c
[uses printf]

stdio.h
[describes printf]



stdio.c
[defines printf]

compile

compile

assembly code
for hello.c

assembly code
for stdio.c

assemble

assemble

link

```
01101001 01001010 10000010 11011001
00101011 01100000 10001011 10111010
```

```
01101001 01001010 10000010 11011001
00101011 01100000 10001011 10111010
```

```
01101001 01001010 10000010 11011001
00101011 01100000 10001011 10111010
```

HTML



final project

projects.cs50.net



```
<!DOCTYPE html>
```

```
<html>
```

```
  <head>
```

```
    <title>hello, world</title>
```

```
  </head>
```

```
  <body>
```

```
    hello, world
```

```
  </body>
```

```
</html>
```

```
<!DOCTYPE html>
```

```
<html>
```

```
  <head>
```

```
    <link href="styles.css" rel="stylesheet"/>
```

```
    <script src="scripts.js"></script>
```

```
    <title>hello, world</title>
```

```
  </head>
```

```
  <body>
```

```
    hello, world
```

```
  </body>
```

```
</html>
```

to be continued...