

9 May 2024

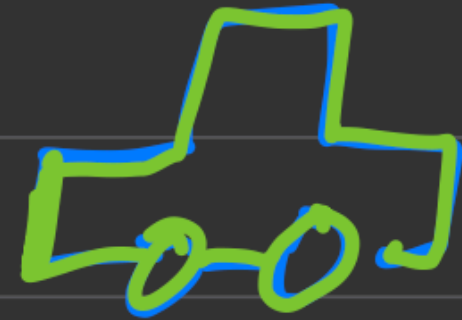
Current work

“One Scene”

The physics equations
are unique only to a
given object.

CAR

- 1 $x = x_0 + v_0 \Delta t + \frac{1}{2} a \Delta t^2$
- 2 $v = v_0 + a \Delta t$
- 3 $\Delta t = t_f - t_i$



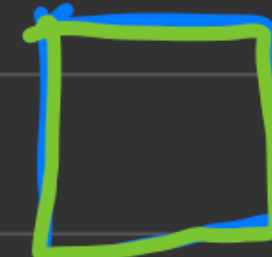
$$x = x_0 + v_0 \Delta t + \frac{1}{2} a \Delta t^2$$
$$v = v_0 + a \Delta t$$
$$\Delta t = t_f - t_i$$

Ball



$$x = x_0 + v_0 \Delta t + \frac{1}{2} a \Delta t^2$$
$$v = v_0 + a \Delta t$$
$$\Delta t = t_f - t_i$$

Box



| object # | eqn # | variable # |

Code: Only ask if we don't know about something already

```
knowns = [  
    {"object_num": 5, "eqn_num": 2, "var_num": 2, "response": "when the truck is at rest"},  
    {"object_num": 5, "eqn_num": 1, "var_num": 1, "response": "when the truck is accelerating"},  
    {"object_num": 1, "eqn_num": 0, "var_num": 2, "response": "when the car is at the starting line"}  
]
```

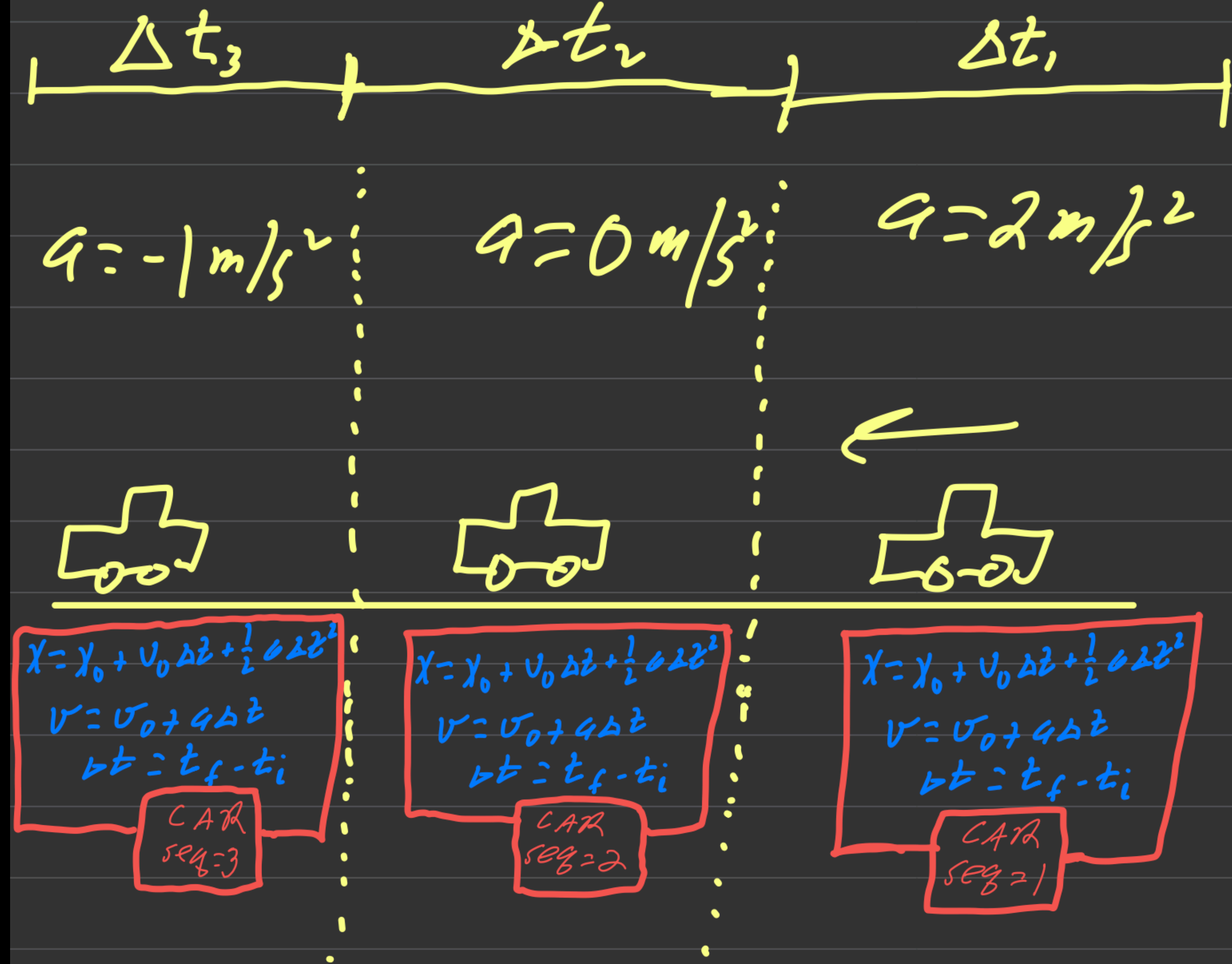
```
object_num = 5      #from binary string  
eqn_num = 2         #from binary string  
var_num = 3         #from binary string
```

```
if {'object': object_num, 'eqn': eqn_num, 'var': var_num} not in knowns:  
    #ok to ask about it
```

Updated plan

Allow for multiple scenes or sequences

The physics equations are unique to 1) a given object AND 2) a sequence in the problem.




(object # / eqn # / variable # / seq #)

Code: Only ask if we don't know about something already

```
knowns = [  
    {"object": "truck", "eqn_num": 5, "var_num": 2, "seq_num": 3},  
    {"object": "truck", "eqn_num": 5, "var_num": 2, "seq_num": 2},  
    {"object": "car", "eqn_num": 5, "var_num": 2, "seq_num": 2}  
]
```

```
object_num = 5      #from binary string  
eqn_num = 2         #from binary string  
var_num = 3         #from binary string  
seq_num = 4         #from binary string  
  
if {'object': object_num, 'eqn': eqn_num, 'var': var_num, 'seq_num': seq_num} not in knowns:  
    #ok to ask about it
```



Next steps

Binary strings need to be evaluated

Find the “fitness” or “score” for each

Binary String (problem solving plan)	Fitness (F)
1001010111111000110100111100110100111000010111010...	5
101011111101111100110100010011111111111100110001101...	2
011010101000111111010011101111111101101001110000101...	11
00000100010000011111101100101001101101010101010000...	7
10100110011100101001001001111010001100111111011001...	4
...	...

How?

```
equation_dict = {  
    0: {  
        "text": "x = x0 + v0x dt + 1/2 ax dt^2",  
        "vars": ["x", "x0", "v0x", "ax", "dt"],  
        "var_count": 5,  
        "label": "x"  
    },  
    1: {  
        "text": "vx = v0x + ax dt",  
        "vars": ["vx", "v0x", "ax", "dt"],  
        "var_count": 4,  
        "label": "vx",  
    },  
    2: {  
        "text": "dt = tf - ti",  
        "vars": ["dt", "tf", "ti"],  
        "var_count": 3,  
        "label": "dt"  
    }  
}
```

- Loop through binary string
- Pull out object #, equation #
- For each object, see how many variables in an equation are known. Call it “k”
- $df = \text{var_count} - k$

- $$F = \sum_i df_i$$