Exercise 6 of PS703106

openCL implementation of image auto-levelling

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Performance comparison:

Hardware:

- GPU: NVIDIA GeForce GTX 960 (2 GB VRAM)
- CPU: AMD Phenom II X6 1075T

Optimizing the sequential solution:

The solution (as submitted) has 2 potential optimisations:

- replacing the 2 for loops over width and height (save) (~ factor 10 improvement)
- replacing every mention of components with 3 (not strictly same program, however the entire program (lines 25-88) could just be copied in an if statment dealing with 4 channels in the else)

OpenCl solution:

Mostly following the outline suggested in the assignment.

Actual runtimes:

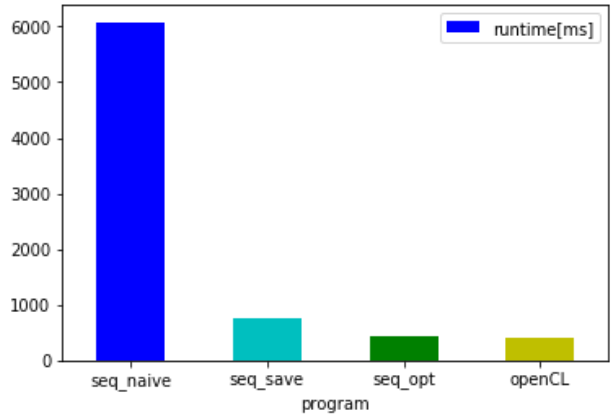
Performed on earth-huge.png as provided with the assignment. We narrowly manage to beat the optimized sequential program, which is surprising given the trivial kind of optimisations performed.

In [6]:
```
import pandas as pd
import numpy as np
from itertools import cycle, islice
df = pd.DataFrame({'program':['seq_naive', 'seq_save', 'seq_opt','openCL
'], 'runtime[ms]':[6075, 760, 447,414.555]})
df
```

Out[6]:

	program	runtime[ms]
0	seq_naive	6075.000
1	seq_save	760.000
2	seq_opt	447.000
3	openCL	414.555

In [20]:
```
my_colors = list(islice(cycle(['b', 'c', 'g', 'y', 'k']), None, len(df))
)
ax = df.plot.bar(x='program', y='runtime[ms]', rot=0,color=my_colors)
```



memory leakes & hardware requirements:

After several executions it can happen that an MEM_OBJECT_ALLOCATION_FAILURE can occur, thus memory leaks on the GPU can be assumed. Also after several hours of debugging (with some bizarr results) it is currently impossible to run the opencl program with the resources provided on a cheap laptop or the lab computers.
From valgrind:
seq: ERROR SUMMARY: 0 errors from 0 contexts
ocl: ERROR SUMMARY: 187 errors from 186 contexts -> as always not very useful

In [ ]: