report

March 13, 2021

1 Tilt (https://github.com/takintilo/tilt)

1.1 Part 1

I held the phone still and took measurements from the accelerometer and gyroscope for one minute, which resulted in 536 readings. By taking the average reading, I found the following to be the bias/noise:

	accelerometer	gyroscope
x	-0.305250467	7.13E-05
y	-0.142084112	-1.33E-04
z	10.06681121	-7.50E-06

1.2 Part 2

[72]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

[73]:
```
g = 9.80665
b = 0.98
```

[74]:
```
raw_data = pd.read_csv("5min.csv")
raw_data = raw_data[:2088]
```

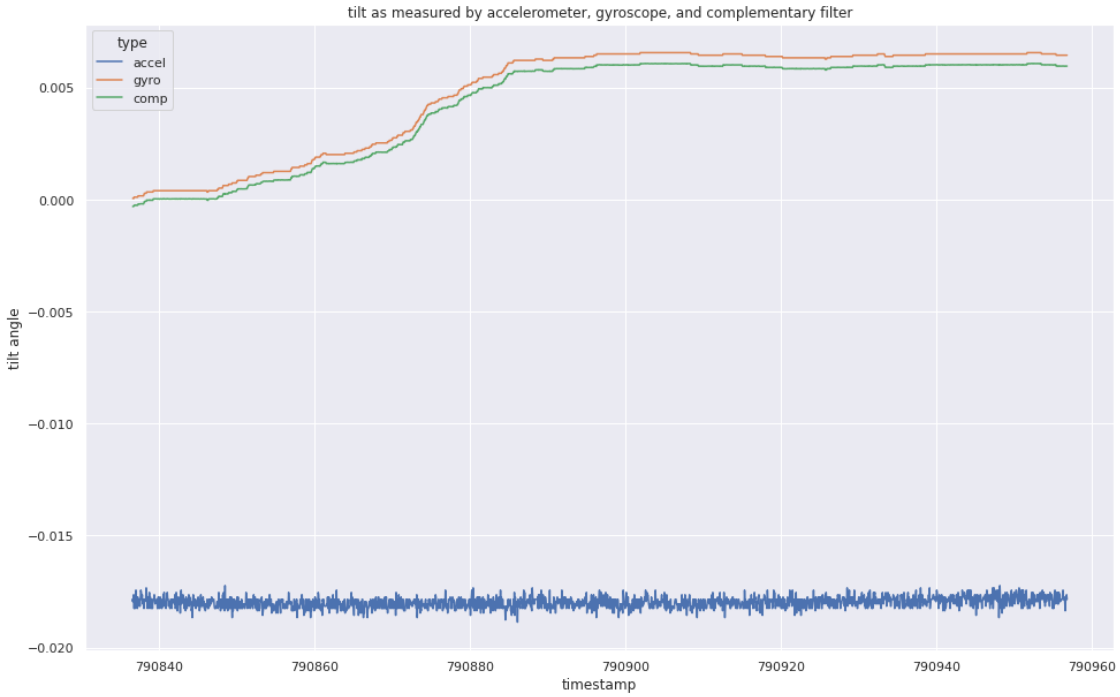
[75]:
```
tilts = pd.DataFrame()
tilts["timestamp"] = raw_data["timestamp"]
tilts['dt'] = raw_data["timestamp"] - raw_data["timestamp"].shift(1)
tilts['accel'] = np.arcsin(raw_data["accel_y"] / g)
tilts['gyro_unsummed'] = raw_data["gyro_x"] * tilts["dt"]
tilts['gyro'] = tilts["gyro_unsummed"].cumsum()
tilts['comp'] = b * tilts["gyro"] + (1-b) * tilts["accel"]
```

[76]:
```
sns.set_theme()
```

[79]:
```
tilts_plot = tilts.melt("timestamp", value_vars=["accel", "gyro", "comp"],␣
↪var_name="type", value_name="tilt angle")
```

[78]:
```
plt.figure(figsize=(16, 10))
sns.lineplot(data=tilts_plot,
    x="timestamp", y="tilt angle", hue="type").set_title("tilt as measured by␣
↪accelerometer, gyroscope, and complementary filter")
```

[78]:
```
Text(0.5, 1.0, 'tilt as measured by accelerometer, gyroscope, and complementary
filter')
```



[ ]:
```

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